IMT School for Advanced Studies Lucca

Lucca, Italy

Katholieke Universiteit Leuven

Leuven, Belgium

The Politics of Globalization

Joint Degree in "Institutions, Markets and Technologies – Curriculum in Economics, Management and Data Science", XXXI Cycle, and in "Business Economics"

By

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2019

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2019

To my family

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Acknowledgements

Chapter 2 is the reproduction of the paper "Low-wage import competition and populist backlash: The case of Italy", co-authored with Guglielmo Barone.

Chapter 3 is the reproduction of the paper "Employment, turnover and profitability effects of the German national minimum wage: A sectoral analysis", co-authored with Dirk Czarnitzki and Jesse Wursten.

Chapter 4 is the reproduction of the paper "Is protection really good for the imposing country? A production network approach", co-authored with Massimo Riccaboni.

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Presentations

1. Barone, Guglielmo, and Helena Kreuter, "Low-wage import competition and populist backlash: The case of Italy". Paper presented at the Florence branch of the Banca d'Italia, September 13, 2017.
2. Barone, Guglielmo, and Helena Kreuter, "Low-wage import competition and populist backlash: The case of Italy". Paper presented at the Workshop on Recent Advances in Public Economics and Quantitative Methods, IMT School for Advanced Studies Lucca, March 9, 2018.
3. Barone, Guglielmo, and Helena Kreuter, "Low-wage import competition and populist backlash: The case of Italy". Paper presented at the Faculty of Business and Economics - KU Leuven, July 9, 2018.

Abstract

Over the past three decades, trade with low-wage countries - in first place China - has grown dramatically. Economic theory has long recognized that trade liberalization, though enlarging the overall economic pie, also produces strong redistributive effects: while it increases aggregate productivity and benefits consumers through lower prices and a wider range of available goods, at the same time it is also associated with substantial adjustment costs in the labour market. As the gains are diffuse but the costs concentrated, the lack of appropriate compensatory mechanisms is likely to drive a backlash against the ongoing economic transformations.

The present dissertation aims at providing further understanding on the consequences of trade globalization for developed countries. Specifically, our focus is on the political dimension of the phenomenon. Indeed, ballot boxes represent a litmus test of economic changes with profound social effects and policymakers are called upon to offer adequate responses to the citizens' requests.

In chapter 2, we study empirically the role of low-wage import competition from China in shaping electoral outcomes in Italy over the period from 1992 to 2013. Given the unequal growth of Chinese exports across sectors, we compare the voting pattern at the national parliamentary elections in about 8,000 municipalities differently exposed to the trade shock according to their ex-ante industry specialization. The model is estimated in first differences and Italian imports from China are instrumented by Chinese exports to other high-income countries.

We find that China's trade liberalization has favoured the spread of populism in Italy. This result is robust to a large number of sensitivity checks as well as to concurrent shocks that may have contributed to spur a populist reaction in the Italian electorate - immigration, the introduction of the Euro and fiscal austerity. Moreover, we show that import competition from China has triggered also other forms of protest vote, namely invalid ballot papers and abstentionism. In line with the

predictions of economic theory, the channels at work turn out to be labour market adjustments.

If trade globalization is a key determinant behind the recent wave of protest vote across the Western World, how can policymakers meet the challenges associated with it? This dissertation assesses the desirability of three distinct economic policies, one intervening directly on the labour market and the other two acting, respectively, at the trade and fiscal level.

In chapter 3, we present a novel approach to analyse the employment growth effects of the introduction of a national minimum wage (€8.50 per hour of work) in Germany on January 1st 2015. Thanks to our access to household survey data and proprietary firm-level data, we compare firms in heavily affected sectors to similar firms in de facto unaffected sectors. Industry vulnerability is determined according to the share of eligible workers with pre-treatment hourly wage below €8.50 - computed separately for East and West Germany. Treated units are linked to control units matching on past employment and forward looking credit ratings.

We detect only very small negative employment effects in East Germany (0.05 percent of overall employment, 22000 jobs lost), mainly concentrated among small firms. The lack of a significant occupational impact still holds when we use different thresholds for treatment assignment or alternative minimum wage bite measures. To explain our finding, we provide evidence that, in West Germany, the minimum wage introduction has also induced positive effects on turnover and a deterioration of credit ratings, while, among treated firms in East Germany, turnover remains stable and credit ratings actually improve.

Thus, ex-ante fears for dramatic job losses seem not justified and minimum wage policy may actually help to mitigate inequality in major industrial economies.

In chapter 4, we develop a simple theoretical framework that allows us to investigate the macroeconomic consequences of sector-specific tariffs on imported intermediates in the presence of input-output linkages among industries. Our model features a large open economy with

multiple perfectly competitive sectors and exogenous market power. Each industry specializes in the production of a distinct good according to a nested Cobb-Douglas-CES technology; its output sales (net of national imports of the same good) meet final demand by a representative household with Cobb-Douglas preferences and intermediate input demand by other sectors. Under wasteful government spending, we establish that a positive sectoral input tariff shock entails a loss in aggregate value added, by lowering output not only of the protected industry's immediate customers but also of its customers' customers and so on.

Assuming next that a given share of each industry's total output is sold on foreign markets, our model can also be used to evaluate the macroeconomic implications of the introduction of border-adjustments into sector-homogeneous corporate profit taxation. We show that a shift to a destination-based regime induces a change in aggregate value added that results from the net effect of border-adjustments' two key components, the impossibility to deduct the costs of imported inputs from the corporate income tax base but the ability to exclude export sales from it. For low sectoral export shares, the network propagation triggered by the implicit import tax is more powerful than that triggered by the implicit export subsidy, leading to a contraction of overall economic activity.

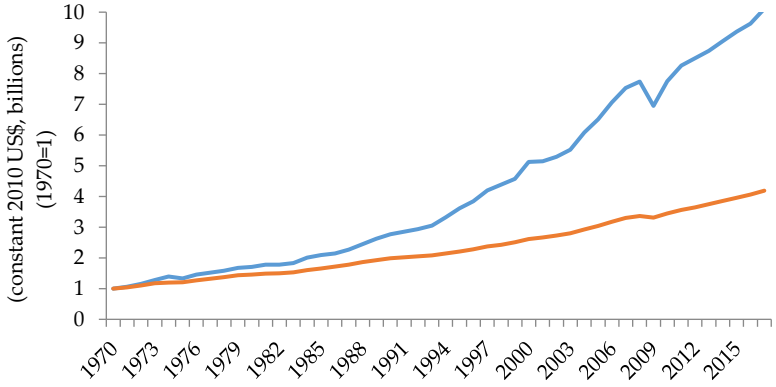
Thus, in today's highly vertically integrated advanced economies, the unilateral adoption of both import tariffs on intermediates and border-adjusted corporate taxes may turn out to be counterproductive for the imposing country even before retaliation is considered.

Chapter 1

Introduction

Since mid-1980s international trade has expanded steadily, marking the onset of the third wave of globalization. In particular, merchandise export volumes have been growing at a much faster pace than production, with even more impressive rates after 2000 (see Figure 1). The trade slowdown caused by the recent global financial crisis seems not to have reversed this trend.

Figure 1.1: Trend in world exports (blu) and gross domestic product (orange)



Source: Worldbank

The extraordinary development of trade, to which Rodrik (2011) refers as "hyper-globalization", was made possible by a subsequent reduction in the costs of moving goods, ideas and people (Baldwin, 2016) as well as by the liberalization of cross-border capital movements, the multilateral dismantling of customs duties in different areas of the world market, the creation of the European Single Market and the increasing fragmentation of production processes in global value chains (Südekum, 2018). A key role was played by the low-wage Asian economies, first and foremost China, which enacted deep economic reforms in the 1980s and 1990s and gained access into the World Trade Organization (WTO) in 2001.

Economic theory has long recognized that trade globalization produces both winners and losers. Specifically, this imbalance may arise on two levels: between countries and within a country.

The central finding of Ricardo (1817) was that free trade produces aggregate welfare gains for all trading partners as it allows countries to specialize in the goods in which they have a comparative advantage. Subsequent literature has put forward a number of arguments for why free trade does not necessarily lead to a win-win situation, including among others, adverse terms of trade (Prebisch, 1950; Singer, 1950; Myrdal, 1957; Nurkse, 1959), unequal exchange (Baran and Sweezy, 1966; Emmanuel, 1972), domestic distortions (Haberler, 1950; Bhagwati, 1963; Johnson, 1965; Bhagwati, 1971) and imbalances between the expansion of imports and exports (Autor et al., 2013).

Anyway, even if a country in aggregate benefits from the process of trade integration, internal inequalities may still exacerbate as trade mandates reallocation of workers and jobs and permanently alters skills demands (IFS Annual Lecture, 2017). This claim is rooted in the well-known Stolper-Samuelson theorem (1941), which has been derived within the traditional Heckscher-Ohlin framework and can be stated in general terms as follows: under competitive conditions, as long as complete specialization is ruled out, there is always at least one factor of production that experiences a decline in its real returns as a result of opening up to trade (Rodrik, 2018). More recently, a number of new mechanisms through which trade can influence within-country income

inequality have been brought to light: hetereogenous firms and bargaining, trade in tasks, labour market frictions, and incomplete contracts (see Harrison, 2011).

Until the late 1990s, the consensus among economists was that the distributive effects of international trade had limited practical relevance. This consensus arose as a result of a number of studies focusing on the increase in the skill-premium - the wage gap between skilled and unskilled workers - observed both in developed and developing countries. With few exceptions (e.g. Wood, 1995; Feenstra and Hanson, 1996), such a trend was mainly explained by skill-biased technological change; other factors considered along with trade were weaker trade unions and immigration.

Yet, the impressive surge in exports from developing countries over the past two decades has prompted empirical analysis, in tune with theoretical developments, to reassess the redistributive effects of trade, with a special focus on developed countries most exposed to low-wage import competition. While several recent contributions have focused on local labour market adjustments (e.g. Autor et al., 2013; Dauth et al., 2014; Malgouyres, 2017a), another approach goes one step further by asking how social groups threatened by trade globalization respond in terms of voting behaviour (Kayser, 2007). Indeed, voting behaviour represents a litmus test of economic changes with profound social effects.

In principle, because free trade brings about an improvement in aggregate economic efficiency, income could be redistributed from the winners to the losers. The so-called compensation hypothesis suggests that globalization leads to welfare state expansion (Cameron, 1978; Ruggie, 1982; Katzenstein, 1985; Rodrik, 1998) as higher integration into the world economy increases individuals' feeling of economic insecurity (Scheve and Slaughter, 2004) and shapes preferences of more vulnerable citizens in favour of social protection (Walter, 2010). Yet, today compensation is economically and politically difficult (Rodrik, 2018): (i) the imposition of the taxes needed to dispense assistance creates deadweight losses and their collection is constrained by the increasing mobility of capital headed towards low-taxation countries; (ii) policymakers are often time-inconsistent; and (iii) the bargaining power

of workers' organizations has weakened in advanced economies over the last few decades. As a result, governments may fail to provide sufficient compensation (Frieden, 2017)

At the end of the last century, new political forces, labelled as populist, have emerged in many Western countries. Since 2000, support for these forces has more than doubled (see Rodrik, 2018), disrupting so long established patterns of party competition (Ingelhart and Norris, 2016). The victory of Donald Trump in the US and the significant electoral results of the Front National in France, the Dutch Freedom Party in the Netherlands, the United Kingdom Independence Party in Great Britain and the Freiheitliche Partei Österreichs in Austria are all examples of a far-reaching tendency. Despite their differences, Mudde (2007) suggests that populist parties share three core features: anti-establishment, nativism and authoritarianism.

What are the causes behind such a political development? Theoretical research on the political economy of populism has pointed to economic insecurity stemming from exposure to globalization as a key determinant (e.g. Guiso et al. 2017; Rodrik, 2018).[1] At the same time, a number of empirical papers has started documenting how various forces associated with globalization, such as low-wage import competition and immigration, give rise to a demand for protectionism (e.g. Scheve and Slaughter 2001a,b; Mayda and Rodrik, 2005; Scheve and Slaughter 2007; Di Tella et al., 2019) and increase support for non-mainstream parties (e.g. Autor et al., 2016; Dippel at al., 2017; Malgouyres, 2017b; Caselli et al., 2018; and Colantone and Stanig, 2018b; Becker and Fetzer, 2016; Fetzer, 2018).

In **chapter 2**, we empirically study the role of trade globalization in shifting the Italian electoral base toward populism. Following the literature pioneered by Autor et al. (2013), the trade shock is proxied with swiftly rising import competition from China. Indeed, thanks to a rapid process of structural transformation and international integration,

[1] Other explanations of the populist success are based either on a backlash against progressive cultural change (Ingelhart and Norris, 2016) or on the 2008-2013 financial crisis (e.g. Guiso et al., 2019; Algan et al., 2017; Dustman et al., 2017).

China's share in world exports rocketed from 2 percent in 1990 to 14 percent in 2015 (WTO Trade Profiles). Italy has not been immune to this impetuous trend; rather, as its initial product specialization model was more heavily centered on the less technologically advanced sectors, Italy was more vulnerable to the China shock than its Western competitors.

Our focus is on the parliamentary national elections that took place in Italy - under proportional rule - between 1992 (globalization take-off) and 2013. Populist parties in each of these elections are identified by relying on the classification provided in Inglehart and Norris (2016). The authors label a party as populist if it scores high on an index of 13 selected policy dimensions contained in the 2014 Chapel Hill Expert Survey, ranging from political, social and religious values, to material interests, to stance towards market deregulation and state management of the economy.

In order to exploit geographic heterogeneity in the Italian production structure, we borrow the specification of local trade exposure derived by Autor et al. (2013) and compare the voting pattern in about 8,000 municipalities differently affected by Chinese import competition according to their ex-ante industry specialization. The model is estimated in first differences and potential endogeneity issues are addressed by instrumenting Italian sectoral imports from China with Chinese sectoral exports to other high-income countries only weakly integrated in terms of trade with Italy.

We find that China's surge in international trade has favoured the spread of populism in Italy. This result is robust to a large number of sensitivity checks - pertaining, among others, to the classification of populist parties and to the measurement of import exposure - as well as to three concurrent shocks that may also have contributed to the spread of populism in Italy - namely immigration, the introduction of the Euro and fiscal austerity. Moreover, we show that voters' protest reaction also takes the form of an increase in invalid ballot papers and a drop in turnout. To rationalize our findings, we assess the role of labour market adjustments as possible transmission channel and we detect that Chinese import competition leads to higher unemployment and lower income and is associated with a rise in inequality.

Thus, the empirical evidence in chapter 2 is consistent with the prediction of economic theory according to which trade globalization creates distributional consequences. The question then is: how can policymakers meet these challenges?

The obvious answer would be to strengthen the welfare state through reforms aimed at supporting the most vulnerable workers and jobs. In this respect, an interesting policy is the minimum wage, which is currently under discussion in Italy. Indeed, according to the ILO Minimum Wage Policy Guide, "the purpose of minimum wages is to protect workers against unduly low pay" and so to help "overcome poverty and reduce inequality". Yet, as pointed out by Neumark (2014), the effectiveness of minimum wages at achieving this goal actually depends on whether they destroy jobs for low-paid workers in poor or low-income families.

Economists have long explored the existence of disemployment effects associated with minimum wage policy (see for a review: Brown et al., 1982; Card and Krueger, 1995; Neumark and Wascher, 2007/8; Schmitt, 2013; Belman and Wolfson, 2014/6). Despite the abundance of studies - mainly focused on the US -, there is still no consensus on the issue: some papers report no, or even, positive employment effects, others provide evidence of job losses.

In **chapter 3**, we contribute to this debate by analysing systematically the employment effects of the introduction of a national statutory minimum wage (€8.50 per hour) in Germany on January 1st 2015. Germany offers an interesting opportunity to reassess the desirability of minimum wage policy from the perspective of a major industrial economy. Indeed, from the mid-1990s onwards, Germany had witnessed the progressive erosion of its collective bargaining system as a result of the introduction of opening clauses after the reunification with Eastern Germany (Schnabel, 1999), the increase in outsourcing of economic activities, the opening up of public services to private providers and the Hartz-Acts of the Schröder government in 2003 (Weinkopf, 2015). By 2013, coverage had fallen from its peak of 85 percent before reunification to just 60 percent in the West and 48 percent in the East (WSI-Tarifarchiv, 2016). This process led to the development of one of the largest low-wage sectors in Europe (Bosch,

2018) so that the bite of the new German minimum wage was strong despite its not particularly high level: about four million eligible employees were paid less than €8,50 in 2014, most of them concentrated in the East and within service sectors (Minimum Wage Commission, 2016).

Moreover, we have access to individual-level data from the German Socio-Economic Panel as well as to proprietary firm-level data from the Mannheim Enterprise Panel. The depth and richness of these datasets allows us to adopt a novel approach in the estimation of how employment growth responds to the introduction of a national minimum wage: we compare firms in heavily affected sectors with similar firms in de facto unaffected sectors. Industry vulnerability is determined according to the share of eligible workers with pre-treatment hourly wage below €8.50 - computed separately for East and West Germany. Treated units are linked to control units, matching on past employment and forward looking credit ratings.

Our results point out only very small negative employment effects in East Germany (0.05 percent of overall employment, 22000 jobs lost), mainly driven by small firms. The lack of a significant occupational impact, which is in line with other ex-post evaluations (for a review, see Caliendo et al, 2018), is confirmed also when we use different thresholds for treatment assignment and alternative measures of the minimum wage bite. To explain this outcome more optimistic than ex-ante predictions, we discuss three potential adjustment channels - complementary to those already identified by existing studies (non-compliance: Burauel et al., 2017; increased unpaid overtime: Burauel et al., 2017; and lower working hours: Burauel et al., 2018). In West Germany, we find that the minimum wage introduction led to a strong growth of turnover and a deterioration of credit ratings (an indicator of profitability), suggesting the presence of positive product demand and price effects and of monopsonistic labour markets. Demand and price effects may be at work also in East Germany, where, in response to the minimum wage policy, turnover remains stable, credit ratings actually improve and firm exit rates are unaffected.

Another possible answer to the distributional challenges brought about

by trade globalization are trade or fiscal policies intended to shield domestic production and raise government revenues. This course of action has been embarked upon by the Trump administration whose motto is "America First". Indeed, in 2018 the US government implemented several rounds of import tariffs - washing machines (20-50 percent), solar panels (30 percent), steel (25 percent), aluminium (10 percent) - and put forward a proposal to introduce border-adjustments into corporate profit taxation, whereby export revenues would be deductible from the corporate tax base, while costs for imported inputs would not.

Optimum tariff theory asserts that a country with monopoly power benefits from imposing unilaterally modest import duties (see Humphrey, 1987). The underlying rationale is that, by restricting imports from abroad, a big country with substantial market power can improve its terms of trade. However, such a conclusion is based on models featuring only final goods. Today, though, much of world trade is in intermediate inputs whose production has been increasingly offshored over time and import tariffs targeted at those goods may not necessarily work out to the advantage of the imposing country (Krugman, 2018).

As for the inclusion of border-adjustments into corporate profit taxation, the proponents of such a policy argue it to be neutral, that is to have no effect on real allocations (see, for example, Auerbach and Holtz-Eakin, 2016). Yet, this neutrality prediction is based on assumptions - first and foremost the trade balance condition - that are unlikely to hold up in reality (Barbiero et al., 2018) and ignores an important feature of today's economies, namely strong interconnections among sectors. These interconnections may play an important role as a channel for the propagation and amplification of the fiscal shock.

In **chapter 4**, we re-assess the macroeconomic consequences of both sectoral input tariffs and a shift to border-adjusted corporate profit taxation, in the light of the above. To this end, we build on the model developed by Acemoglu et al. (2012, 2016) (for a literature review on production networks in macroeconomics, see Carvalho et al. 2018), which allows us to account for inter-industry input-output linkages.

Specifically, we consider a large open economy populated by a representative household and by multiple perfectly competitive industries, each specialized in the production of a distinct good. The representative household has Cobb-Douglas preferences over the different goods and provides labour services (with disutility) to firms at a sector-homogenous wage rate. Output at each node is produced according to a constant-returns-to-scale Cobb-Douglas technology that combines labour with a composite intermediate good, whose components are in turn a CES aggregate of a domestic and a foreign variety, the latter being subject to sector-specific import duties. For simplicity, we assume domestic and foreign pre-tax prices to be in a proportional relation, the pass-through of the tariff rate into import price to be exogenous, and tariff revenues to be wasted.

Our model predicts that positive sector-specific input tariff shocks lead to a loss in aggregate value added: indeed, being forced to use less intensively the foreign intermediate input variety, the immediate customers of the protected industry suffer a drop in productivity, which induces them to cut back their production and raise prices (relative to the wage); a powerful cascade of downstream adjustments then ensues, as every indirect customer of the protected industry (i.e. its customers' customers and so on) will also find it optimal to reduce output by some amount. This result questions the optimality of protective import duties even before retaliation is considered.

Moreover, treating exports from any industry as a given share of its output, we show also that the change in aggregate value added induced by a shift to a destination-based corporate tax system results from the net effect of border-adjustments' two key components, the impossibility to deduct the costs of imported inputs but the ability to deduct export sales. While the former causes GDP to shrink by lowering input demand of importing industries and its (direct and indirect) downstream customers, the latter drives GDP upwards by increasing input demand of the exporting industries and its (direct and indirect) downstream customers. For low sectoral export shares, the negative impact of the implicit import tax dominates over the positive impact of the implicit export subsidy.

Chapter 2

Low-wage import competition and populist backlash: The case of Italy

2.1 Introduction

In many developed Western societies, populism is on the rise at an alarming pace. The outcome of the Brexit referendum and the election of Donald Trump in the US are the most eye-catching examples of this phenomenon, but several other countries are witnessing similar tendencies: in Italy, France, Germany, the Netherlands, Austria, and the Czech Republic, populist parties recently achieved large electoral support at general polls. Such a political backlash has given rise to a widespread debate on its causes.

Trade globalization is one of the key candidate economic determinants, the channels at work being labor market adjustments. Autor et al. (2013) outline a simple theoretical trade model based on monopolistic competition and heterogeneity in industry labor productivity across countries, according to which positive shocks to low-wage countries' export supply can cause employment in the traded-good sectors of developed countries to contract on net as long as trade is not balanced. This mechanism captures the widely held perception of the redistributive effect of trade globalization *between* countries, with

developed economies being the losers and low-wage developing exporters the winners. On the other hand, trade theory also posits redistributive effects *within* (developed) countries. As recently pointed out by Rodrik (2018)[2], the theorem in Stolper and Samuelson (1941) entails very neat distributional implications from opening up to trade: assuming a two-good and two-factor model of production, with no frictions in the inter-sectoral mobility of inputs, trade liberalization makes the factor that is used intensively in the importable good worse off, by inducing a decline in its payment. If the two factors are skilled and unskilled labor, the prediction for rich countries would be that trade increases the return to skilled labor and lowers the return to unskilled labor, so raising income inequality.[3]

In this chapter, we empirically study the role of trade globalization in moving the equilibrium of the political game toward populism. We compare the voting patterns at the Italian parliamentary national elections over the 1992-2013 period (starting from the trade globalization take-off) in about 8,000 municipalities differently exposed to the trade shock. The model is estimated in first differences so as to control for municipality-level time-invariant idiosyncratic shocks, while a full set of time fixed effects accounts for country-level time-varying perturbations. Following the literature, Chinese import competition proxies for trade globalization (Autor et al., 2013; Autor at al., 2016; Dippel et al., 2017; Malgouyres, 2017b; Caselli et al., 2018; Colantone and Stanig, forthcoming). The populist vote is computed by relying on the classification of populist parties provided in Inglehart and Norris (2016).

The identification of a causal effect requires dealing with the potential endogeneity of import exposure, which may arise from various sources. For example there may be omitted municipality-time level unobserved

[2] Beyond theoretical arguments, Rodrik (2018) suggests also that the populist backlash is not a surprise in light of economic history: the first era of globalization started in the second half of the nineteenth century, led to the emergence of history's first self-conscious populist movement in the US rallying against the Gold Standard and ended in the first half of the twentieth century with the spread of communism, fascism and Nazism.

[3] See Harrison et al. (2011) for a survey of recent works exploring new channels through which trade can affect income inequality (e.g. firm-heterogeneity and bargaining, trade in tasks, labour market frictions and incomplete contracts).

shocks like a sectoral, asymmetric, negative shock to local manufacturing industries that may attract imports from China and, at the same time, induce a populist reaction among voters; this would bias the OLS parameter upward. Moreover, the populist vote may result in protectionist policies that reduce import flows: in such a case reverse causality would lead to a downward bias. Finally, we can not exclude that we are measuring trade shock with some errors. To address the possible endogeneity issue, we instrument imports from China with Chinese exports to a set of other non-euro high-income countries that represent a small share in Italy's total trade. The instrument is intended to capture only the push factor underlying the Chinese export performance; at the same time, it involves economies only weakly connected to Italy in terms of trade, so minimizing the risk of invalidating the exclusion restriction assumption.

Our results show that exposure to Chinese import competition enlarges support for populist parties: the IV preferred specification indicates that a one-standard deviation increase in the annual change of imports from China (about 145 dollars per worker at 2000 prices) entails a rise in the annual change of the populist vote share equal to 0.4 percentage points, about one third of the average value of the dependent variable and one tenth of its standard deviation. The magnitude of the impact is non-negligible, especially if one takes into account that the vote response regards *all* voters and not just those working in the tradable sectors. This result is robust to a number of robustness checks, including measurement of the trade shock and the classification of populist parties. Moreover, it holds when we augment our regression with potential confounding factors that may have spurred populism in recent years: immigration, the introduction of the euro and fiscal austerity. Additional findings show that voters' protest reaction also takes the form of an increase in invalid (blank and null) ballot papers and a drop in voter turnout. To rationalize our results, we show that Chinese import competition has negatively affected employment and income, so signaling that globalization has had a redistributive role *between* countries. Moreover, combining data on income distribution at the municipality-year level with exposure to Chinese import competition, it turns out that the latter is also positively correlated with inequality:

winners and losers from globalization also emerge *within* the country under scrutiny.

The present chapter is related to the empirical literature on the political consequences of trade globalization. Earlier works investigate how trade openness shapes individual preferences, either in favour of more redistribution (e.g. Walter, 2010) or in favour of protectionist policies (e.g. Scheve and Slaughter 2001b; Mayda and Rodrik, 2005; Blonigen and McGrew, 2014). More recently, focus has shifted to the impact of foreign competition on actual electoral outcomes at the local level. Within this strand of the literature - pioneered by Margalit (2011)[4] - Autor et al. (2016) is the seminal paper looking at the role of rising exports from China on *political polarization*: the Chinese import shock affects the ideological composition of the US Congress, with politicians moving toward the very left or the very right of the political spectrum. Other studies for the US test the existence of a *realignment effect* (Che et al., 2016) or an *anti-incumbent effect* (Jensen et al., 2017). More closely related to our analysis are four contributions, those by Dippel at al. (2017), Malgouyres (2017b), Caselli et al. (2018), and Colantone and Stanig (2018b). While adopting the same methodology to measure import exposure (borrowed from Autor et al., 2013; Autor et al., 2016), they basically differ in the countries examined and share the result that import competition from low-wage countries increases voting for far-right parties.[5]

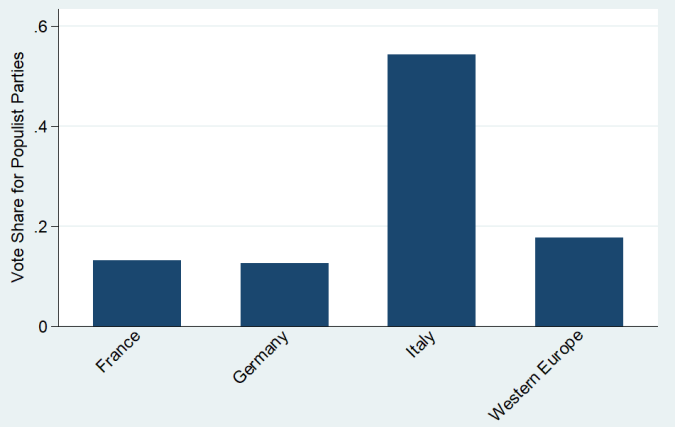
An important but less related reference is the research agenda shedding light on the determinants of populism. While some scholars propose a cultural backlash hypothesis to explain today's success of populist parties in the Western World (e.g. Ingelhart and Norris, 2016), others trace it back to economic insecurity, resulting especially from globalization (e.g. Guiso et al. 2017; Rodrik, 2018) and the financial crisis of 2008-2013 (e.g. Guiso et al., 2019; Algan et al., 2017; Dustman et al., 2017). Finally, as far as the transmission channel is concerned, we also

[4] The author uses an innovative but narrow measure of trade exposure focusing on layoffs.
[5] Dippel et al. (2017) study German NUTS 3 regions (slightly more than 400 *Landkreise*) from 1987 to 2009; Malgouyres (2017b) focuses on French communities (about 3,500 cantons) from 1995 to 2012; Caselli et al. (2018) use labour market areas (over 600 systems) as main unit of analysis from 1994 to 2008; finally, Colantone and Stanig (2018b) combine district-level voting data and European NUTS 2 region-level trade data between 1988 and 2007.

draw on the empirical literature that, in the wake of Autor et al. (2013), assesses the impact of low-wage import competition on local labour markets in developed countries (e.g. Dauth et al., 2014; Malgouyres, 2017a), indicating significant adjustment costs in terms of job displacement and reduced earnings.[6]

We contribute to the existing literature in many respects. First, as Caselli et al. (2018), we consider the Italian case, which is particularly interesting for three reasons. (*i*) Italy displays by far one of the highest vote shares for populist parties among large rich countries, according to the data recorded in the most recent elections (see Figure 2.1). (*ii*) Since the nineties, Italy's imports from China have increased at an impressive average rate, comparable to that of other similar countries; however, at

Figure 2.1: Populism in some Western countries

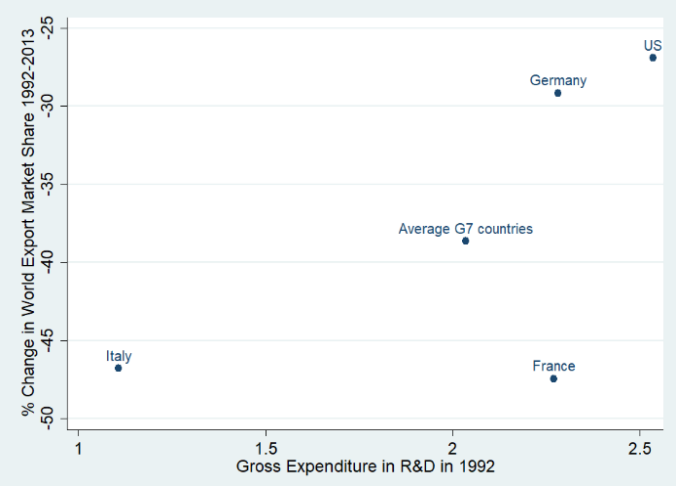


Note: Vote share won by all populist parties in the last available parliamentary election in France (2017), Germany (2017), Italy (2018), and Western Europe. The latter aggregate includes all countries (except Switzerland) considered in Colantone and Stanig (forthcoming) and is weighted using the 2016 population. Parties are labelled as populist based on the classification by Inglehart and Norris (2016).
Source: Own calculations based on the elections datasets: http://www.parlgov.org/ and http://elezioni.interno.gov.it/camera/scrutini/20180304/scrutiniCI.

[6] Analyses carried out at the level of national industries lead to similar conclusions as for the negative implications of import competition on labour market outcomes (e.g. Federico et al., 2014; Pierce and Schott, 2016; Acemoglu et al., 2016).

the same time, the beginning-of-period Italian product specialization model was more heavily centered on the less technologically advanced sectors (e.g., textile, apparel, leather, footwear, furniture) with respect to Western competitors, so making the country more vulnerable to the China shock. In Figure 2.2, we show that in 1992 the Italian economy spent a largely smaller share of its GDP on research and development than other highly industrialized countries and that the Italian loss in worldwide export market shares over the 1992-2013 period was larger than the average. (*iii*) Populism makes sound economic policies more difficult to implement, even if populist parties are not in power, because non-populist parties tend to react to populism by reducing the distance of their platform from that of their populist competitors (Guiso at al., 2017).[7] On the other hand, we think that lessons from the Italian case may well be informative about other developed countries.

Figure 2.2: R&D expenditure and worldwide market share dynamics



Note: The Group of Seven (G7) includes: Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.
Source: Own calculations based on WTO and OECD data.

[7] In this respect, Italy is one of the Western developed countries that has more urgently needed structural, but often unpopular, reforms to spur growth during the last 15-20 years: see IMF (2017), OECD (2017).

Second, we focus on populism as a voting outcome, rather than on extreme right parties. It is increasingly recognized that certain core features of populist parties are not necessarily prototypical of a radical right party. From an empirical point of view, the two variables do not necessarily coincide and the Italian case is very suitable to distinguish between them. The Five Star Movement, in fact, is a large political party that is labelled as populist by all the prevailing classifications, but, at the same time, cannot be placed along the usual right-left dimension of the political spectrum (Bordignon and Ceccherini, 2015). Not surprisingly, the correlation in our data between the vote share for extreme-right parties and the vote share for populist parties is far from perfect (-0.26)[8].

Third, our study addresses the very important issue of the robustness of the results to concurrent factors that are likely to have contributed to the rise of populism: immigration, the introduction of the euro in the late nineties and the recent measures of fiscal austerity implemented in the Euro area.

Fourth, we enrich our knowledge on the labor market adjustments, showing that the increase in *within*-country income inequality goes hand in hand with the distributional frictions *between*-countries.

Fifth, our very fine spatial breakdown is beneficial to the empirical strategy, as the exposure to low-wage import competition, which strongly depends on the sectoral composition of local economies, varies greatly even among neighboring municipalities. Hence, less fine territorial units used in other papers may mask useful heterogeneity.[9]

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[8] We identify as extreme right parties: Italian Social Movement – National Right (*Movimento Sociale Italiano – Destra Nazionale*); Social Movement – Tricolour Flame (*Movimento Sociale – Fiamma Tricolore*); Tricolour Flame (*Fiamma Tricolore*); New Force (*Forza Nuova*); National Front (*Fronte Nazionale*); Social Alternative (*Alternativa Sociale*); National Right (*Destra Nazionale*); The Right – Tricolour Flame (La Destra – Fiamma Tricolore); Casapound Italy (*Casapound Italia*); National Project (*Progetto Nazionale*); Italian Missinian Refoundation (*Rifondazione Missina Italiana*).

[9] The average size of an Italian municipality is 7,000 inhabitants, to be contrasted with 19,000 in French "cantons" (Malgouyres, 2017b), 198,000 in German *Landkreise* (Dippel el al., 2017), 97,000 in Italian "local labour systems" (Caselli et al., 2018), and 1,800,000 in European regions (Colantone and Stanig, 2018b). Additional findings in Caselli et al. (2018) suggest that the use of more disaggregated data is desirable in the study of the electoral consequences of trade globalization.

The rest of this chapter is organized as follows. The next Section discusses data and measurement issues, while Section 2.3 describes our empirical strategy. In Section 2.4, we present our core findings on the effect of trade shock on populism (and other forms of protest vote), while Section 2.5 is devoted to showing our results on the labor market transmission channel. Section 2.6 concludes.

2.2 Data and measurement issues

Measuring exposure to import competition. To measure the exposure of Italian municipalities to import competition from China, we use the index developed by Autor et al. (2013), which maps sector-specific national import shocks to local units on the basis of their initial industry specialization:

$$\Delta IC_{it} = \sum_k \frac{L_{ikt_0}}{L_{it_0}} \frac{\Delta M_{kt}^{ITA}}{L_{kt_0}} \tag{2.1}$$

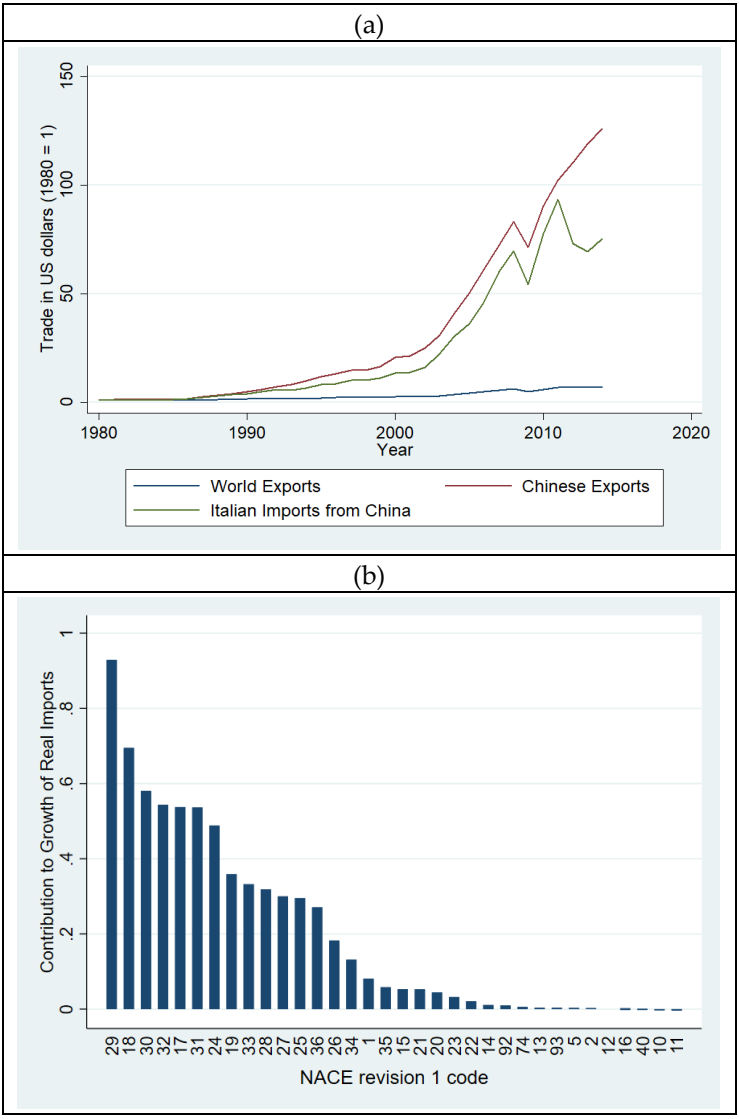
where i indicates municipalities, t denotes years, k represents tradeable sectors and t_0 refers to Census years, which fall in Italy at the beginning of every decade. ΔM_{kt}^{ITA} is the yearly average change in (real) imports from China to Italy observed in sector k between t and t - n. L_{kt_0} is the start-of-decade Italian employment in sector k. L_{ikt_0} is the start-of-decade employment in municipality i and sector k. L_{it_0} is the start-of-decade total employment in municipality i. According to equation 2.1, import competition from China will affect more strongly municipalities where the start-of-decade employment structure is dominated by industries witnessing larger subsequent increases in Chinese imports per worker.

Data on imports are taken from the Observatory of Economic Complexity at the MIT Media Lab, which combines historical Feenstra's data (1962-2000) from the Center for International Trade Data with more recent data (2001-2014) of UN COMTRADE. We have access to annual bilateral trade flows for 262 countries and 989 different products for the

four-digit SITC revision 2 classification over the timespan 1962-2014. Employment at the municipality-sector level is drawn from the Italian Statistical Agency (Istat) for the Census years 1991, 2001 and 2011. Up to 2001 the number of workers in local units of enterprises is based on the two-digit NACE revision 1 breakdown, while for 2011 it is available according to the two-digit NACE revision 2 classification. NACE revision 2 codes have been converted to NACE revision 1 codes using the conversion matrix reported in Perani and Cirillo (2015). The administrative boundaries of Italian municipalities are those used in the Istat 2011 general Census. In order to match trade data with employment data, SITC revision 2 commodities must be matched with NACE revision 1 industrial categories. We use the correspondence table between SITC revision 2 and ISIC revision 3 (equivalent to NACE revision 1 up to two digits) provided by Affendy et al. (2010). Trade values of not-uniquely-mapped goods are assigned to two-digit NACE revision 1 sectors using, firstly, the UN conversion table between SITC revision 2 and SITC revision 3 in combination with the WITS concordance table between SITC revision 3 and NACE revision 1, and then, eventually, national employment shares at the start of the decade (reflecting the initial importance of each sector in the economy). At the end, we are left with international trade data for 34 two-digit NACE revision 1 industries, almost all of them concerning non-service activities (see Table 2.A2). Trade flows for Italy have been deflated by applying the Italian implicit gross value added deflator, taken from the OECD STAN database.

Figure 2.3a shows that Chinese exports took off at the beginning of the nineties. Since then, they have been growing at a much faster pace with respect to worldwide exports, and Italy has not been immune to such an impetuous trend. In Figure 2.3b, we display the sectoral contribution to the total growth rate of real imports from China over the period under examination. Between 1992 and 2013, Italian imports from China grew eight-fold, so that by 2013 China became Italy's third largest import origin after Germany and France; the compounded average growth rate exceeded 10 percent. The main contributions came from machineries (NACE revision 1 codes 29 and 30), textiles and wearing apparel (17, 18), electrical machinery and communication equipment (31, 32), chemical products (24) and leather and footwear (19).

Figure 2.3: Export dynamics



Note: The sectoral contribution to the growth rate of real Italian imports from China over 1992-2013 is computed as: $\frac{imports_{k,1992}}{imports_{1992}} * \left(\frac{imports_{k,2013}}{imports_{k,1992}} - 1\right)$, where k indexes tradeable sectors (see Table 2.A2 for a description of the two-digit NACE revision 1 codes).

Source: Own calculations based on international trade data from the Observatory of Economic Complexity at the IMT Media Lab.

Identifying populist parties. Data on election outcomes at national polls come from the Ministry of Interior and are available at the municipality level (around 8,000 municipalities).[10] We sourced information on the votes for each party, the invalid ballot papers, and the turnout at the polling booths for the general parliamentary elections that took place in 1992, 1994, 1996, 2001, 2006, 2008, and 2013. In light of the broader political involvement envisaged by the regulation of the Chamber of Deputies, our focus is specifically on the national elections for the lower house of the legislature.[11] Finally, over the years under scrutiny, the electoral rules changed, with a different mix of parliamentary seats assigned by a majoritarian rule or by a proportional rule. In all elections, we focus on votes under the proportional rule, which is more apt to mirror political preferences.

With voting data in hand, we identify populist parties by relying on the classification developed by Inglehart and Norris (2016), who take Mudde's (2007) very influential contribution as a basis. Mudde (2007) suggests that populism presents the following recurring features: (i) anti-establishment ideology that considers society to be ultimately separated into two homogenous and antagonistic groups – the 'pure people' and the 'corrupt elite' – and argues that politics should be an expression of the will of the people; (ii) authoritarianism belief in a strictly ordered society in which infringements of authority are to be punished severely; and (iii) nativism, holding that states should be inhabited exclusively by members of the native group ("the nation"), and non-native elements – whether persons or ideas – are fundamentally threats to the homogenous nation-state. Inglehart and Norris (2016) bring these ideas to the data by exploiting the 2014 Chapel Hill Expert Survey (CHES) in which 337

[10] http://elezionistorico.interno.it/. Data at our disposal do not include the small autonomous Aosta Valley region (0.2 per cent of the Italian population).

[11] The Italian parliament is composed of two houses: the Chamber of Deputies and the Senate of the Republic. According to the principle of perfect bicameralism, the two houses perform identical functions. The only differences between them lie in the membership and the rules for the election of their members. The Chamber of Deputies has 630 members, who must be at least 25 years old and are elected by all Italian citizens over the age of 18. The Senate has 315 members, who must be at least 40 years old and are elected by all Italian citizens over the age of 25. In addition to elected members, the Senate also includes life senators, who are appointed by the President of the Republic.

political scientists rate the positioning of 268 parties (those with seats in parliaments) on 13 policy areas.[12] Experts' answers are mapped into a score and a party is evaluated as populist if its scores on those items related to anti-establishment sentiment, popular will, nationalism, and traditional values are above a given threshold. Italian parties coded as populist, available only for the 2013 elections, are the Northern League (*Lega Nord*), the Five Star Movement (*Movimento Cinque Stelle*) and the Brothers of Italy (*Fratelli d'Italia*). In relation to our aim, this list has two limitations: it does not cover the full spectrum of Italian political forces (those that did not win any seat at the parliament) and, more importantly, it does not take into account political forces involved in the elections before 2013. Hence, we properly integrate the list by tracing back the parties so that it ultimately includes the Northern League (Lombard League in 1992), the National Alliance (*Alleanza Nazionale*), the Italian Social Movement (*Movimento Sociale Italiano*), the Tricolor Flame (*Fiamma Tricolore*), the Right-Tricolor Flame (*La Destra-Fiamma Tricolore*), Brothers of Italy (*Fratelli d'Italia*), and the Five Star Movement (*Movimento Cinque Stelle*). Table 2.A3 reports the year-by-year list of populist parties considered here.

Inglehart and Norris (2016)'s categorization is not the only one. Van Kessel (2015) proposes a competing classification, adopted in Guiso et al. (2017), whose main advantage is that the populist party classification covers many years. However, differently from Inglehart and Norris' (2016) classification, van Kessel's (2015) approach captures only one of the three dimensions (the anti-elite rhetoric) that Mudde (2007) highlights. On the other hand, the drawback with Inglehart and Norris's (2016) classification – i.e., the fact that it is time-invariant – is not very relevant in our case as we focus only on a single country and, therefore, recovering the time dimension of the data is straightforward.[13] The main difference between the two classifications is that van Kessel (2015) labels

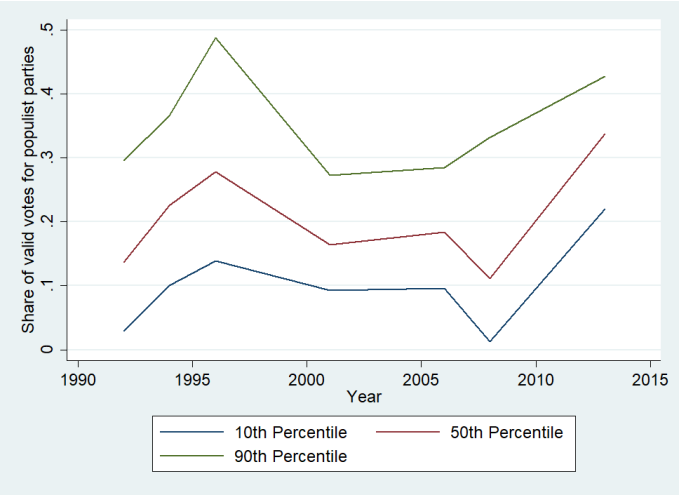
[12] They include support for traditional values, liberal social lifestyles, nationalism, tough law and order, multiculturalism, immigration, rights for ethnic minorities, religious principles in politics, rural interests, wealth redistribution, as well as stance towards market deregulation, state management of the economy, and preferences for either tax cuts or public services.

[13] As far as Italy is concerned, the categorization in Rodrik (2018) coincides with that of van Kessel (2015).

as populist the parties headed by Berlusconi (*Forza Italia* and the People of Freedom – *Popolo delle libertà*), but not all post-fascist parties (the National Alliance, the Italian Social Movement, the Tricolor Flame, the Right-Tricolor Flame, Brothers of Italy). Anyway, we show that our results are robust either when we adopt the definition by van Kessel (2015) or when we enlarge our notion to include the parties in the coalitions led by Berlusconi.[14]

Figure 2.4 shows the increasing overall populist vote trend in Italian general elections. In 1992 the populist share was about 15 per cent; in the next two elections it rose, exceeding 25 percent four years later; after that, the populist share went monotonically down (except for the 2006 election), dipping to slightly below 15 percent in 2008. Finally, in the 2013 election, the populist parties nearly tripled their share. The figure also shows large variability in populism across municipalities.

Figure 2.4: Populism trend



Source: Own calculations based on election data from http://elezionistorico.interno.it/.

[14] The classifications of populist parties considered here are in line with previous works studying the phenomenon of populism within the Italian context (e.g. Passarelli and Tuorto, 2012; Passarelli, 2013; Agnew and Shin, 2017).

2.3 Empirical strategy

To assess the causal effect of import competition on the populist vote, we adopt the following specification:

$$\Delta Y_{it} = \beta \Delta IC_{it} + X'_{it_0}\gamma + \delta_t + \gamma_{r(i)} + \varepsilon_{it} \quad (2.2)$$

As above, i indicates municipalities. t now specifically denotes the election years (1994, 1996, 2001, 2006, 2008, 2013) and t_0 refers to the Census years 1991 (for the periods 1992-1994, 1994-1996, 1996-2001) and 2001 (for the periods 2001-2006, 2006-2008, 2008-2013). ΔY_{it} is the average annual change of the populist vote share between two subsequent elections. ΔIC_{it} is the trade shock defined in equation 2.1, with n equal to the length of a parliamentary term. δ_t are period fixed effects and $\gamma_{r(i)}$ are region-level fixed effects (r = North, Centre, South). X_{it_0} includes a set of (time- variant and invariant) variables - all measured at the start of the decade -, which aim at controlling for economic, demographic, social and geographic differences across municipalities: the share of workers employed in manufacturing sectors, the population density, the share of female working-age population, the share of the population that holds at least a high-school diploma, the aging index, a dummy capturing whether the territory is coastal or not, and a measure of terrain roughness. Data for all these covariates are taken from Istat. ε_{it} is an idiosyncratic shock. Table 2.A1 shows the main descriptive statistics.[15]

Estimating a first difference model allow us to control for municipality-level time-invariant heterogeneity. However, endogeneity might arise primarily from omitted municipality-period idiosyncratic shocks. For example, suppose that a negative sectoral shock hits the domestic economy: if the spatial distribution of the affected industry is not uniform (as is often the case), the shock may disproportionally worsen the municipality labor markets specialized in that industry, so generating a populist reaction at the polls; at the same time, the negative

[15] Like the literature in the field, we cannot distinguish demand and supply effect (Guiso et al. 2017): our results are about the effect of the import competition shock on the political market equilibrium.

sectoral shock may attract imports from China. In such a case, the OLS estimate for β would be upward biased. On the other hand, reverse causality may generate downward bias if populism gives rise to protectionist measures, and measurement error might be at work too.

To address the potential endogeneity bias we follow the approach in Autor et al. (2013) and instrument ΔIC_{it} with:

$$Z_{it} = \sum_k \frac{L_{ikt_0}}{L_{it_0}} \frac{\Delta M_{kt}^{OTHER}}{L_{kt_0}}. \quad (2.3)$$

Equation 2.3 is analogous to equation 2.1 except for ΔM_{kt}^{OTHER}, which is the yearly average change (over a parliamentary term) in real import flows of industry-k goods from China to a set of non-euro OECD countries that exhibit high growth rates of trade with China over the last decades, but whose average share in total Italian trade was below 1 per cent between 1992 and 2013: Norway, Denmark, Australia, Canada, Iceland and New Zealand.[16] The idea underlying Z_{it} is that it captures only supply-side improvements in Chinese export competitiveness (due, for example, to productivity growth); at the same time, we assume that Z_{it} affects the populist vote only through its effect on ΔIC_{it}. This assumption might be invalidated were we to take advanced economies with strong trade connections to Italy as alternative destination areas. To minimize this risk, we selected high-income countries that are weakly integrated (in trade terms) with Italy.

2.4 Results on populism

Baseline findings. Table 2.1 shows the baseline estimates. In column 1, we start by displaying the OLS results of a very parsimonious specification including only import competition and period fixed effects.

[16] Trade flows of each of these countries have been deflated by applying the respective implicit gross value added deflator, taken either from the OECD STAN database (if available) or from the EU KLEMS database.

Estimates suggest a positive (and highly statistically significant) correlation between the change in the trade shock and the change in the populist vote share. In the next two columns, we enrich the specification by including area fixed effects $\gamma_{r(i)}$ and other controls X_{it_0}: the point estimate of the coefficient of interest and its precision are very stable.

Table 2.1: Baseline estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Δ(import exp.)	0.0317	0.0303	0.0352	0.0213	0.0190	0.0249
	(0.0050)***	(0.0049)***	(0.0059)***	(0.0057)***	(0.0054)***	(0.0078)***
First Stage:						
IVΔ(import exp.)				0.1369	0.1340	0.1165
				(0.0235)***	(0.0228)***	(0.0177)***
F-stat excl. instr.				33.99	34.62	43.07
Period FE	Y	Y	Y	Y	Y	Y
Area FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y
Election years	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013
Est. method	OLS	OLS	OLS	IV	IV	IV
Observations	48,081	48,081	48,072	48,081	48,081	48,072

The dependent variable is the average annual change in the populist vote share between two elections. Votes are categorized as populist following Inglehart and Norris (2016). Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

Columns 4-6 document the results derived using the IV estimator. The instrument is always highly significant in predicting the potentially endogenous variable. The impact of the trade shock on the share of preferences for populist parties is highly significant, though slightly smaller in size than its OLS counterpart. The downward revision of the point estimates suggests that the potential omitted variable bias stemming from a negative sectoral supply shock dominates the potential downward bias related to reverse causality and/or measurement error. In our preferred specification in column 6, which includes area fixed effects and controls, the estimate for the coefficient of interest is 0.0249 and is very precisely measured. To put this into perspective, a one-standard deviation increase in the China imports yearly change (about 145 dollars per worker at 2000 prices) entails a rise in the annual change of the populist vote share equal to one third of the average value of the

dependent variable and one tenth of its standard deviation. The impact is non-negligible, especially if one considers that the vote response regards *all* voters, and not just those working in the tradeable sectors (about 45 per cent of total workers) who are directly affected by rising trade exposure.

Robustness checks. In Table 2.2, we carry out a number of robustness checks for our preferred specification (Table 2.1, column 6). A first set of robustness checks deals with the challenge of properly identifying populist parties. As outlined in Section 2, van Kessel (2015) proposes an alternative list of Italian populist parties which excludes Brothers of Italy (and, implicitly, its forerunner parties such as the Italian Social Movement, etc.), but includes Berlusconi's political forces *Forza Italia* and *Popolo delle Libertà* (that is, *Forza Italia* fused with National Alliance). When we rely on this classification – which we enrich by including all minor parties in the coalition led by Berlusconi – results are confirmed (column 1). We also check for the robustness of our classification to the inclusion of Berlusconi's and his allies' parties and, again, our findings are undisputed (column 2). We computed the populist vote share by including in the denominator valid votes for all parties, while the currently available classification of populist political forces does not scrutinize minor parties (those with no seats in the Parliament; see Section 2). In column 3, we re-compute the populist vote share with respect only to votes for parties with parliamentary representation and the coefficient of interest is again stable.

The next four columns address measurement issues that pertain to the key independent variable. We chose import competition from China as our preferred measure of trade shock for the sake of comparability with the field literature. However, one might reasonably argue that China is not the only big player in trade globalization. Among Italy's top import origin areas in 2013 – defined as those whose share of total Italian imports exceeds 4 per cent – the group of countries belonging to Central and Southeastern Europe plays a relevant role, too, mainly because of

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Measuring Popilism			Measuring Import Competition					Others	
	Van Kessel	I&N & Berlusconi	I&N Parl. Seats	Imports from more countries	Imports to more countries	Norm. Init. absorb	Net imports	Exclude 1992	LLMs	Area * trend FE
Δ(import exp.)	0.0137	0.0136	0.0353	0.0159	0.2131	0.1117	0.0009	0.0151	0.0718	0.0133
	(0.0043)***	(0.0043)***	(0.0105)***	(0.0041)***	(0.1038)**	(0.539)**	(0.0001)***	(0.058)***	(0.0182)***	(0.0039)***
First stage:										
IVΔ(import exp.)	0.1165	0.1165	0.1165	0.1953	0.0136	0.0819	0.0042	0.1123	0.1740	0.1131
	(0.0177)***	(0.0177)***	(0.0177)***	(0.0381)***	(0.0004)***	(0.0017)***	(0.0000)***	(0.0164)***	(0.0477)***	(0.0164)***
F-stat excl. instr.	43.07	43.07	43.07	26.34	1356.71	2342.62	75870.36	47.16	13.32	47.65
Period FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Election Years	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013
Est. method	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Observations	48.072	48.072	48.072	48.072	48.072	48.072	48.072	48.072	3.636	48.072

The dependent variable is the average annual change in the populist vote share between two elections. Votes are categorized as populist following Inglehart and Norris (2016), except for column (1) in which we follow van Kessel (2015) and column (2) in which we include *Forza Italia* and *Popolo delle libertà* in the original Inglehart and Norris (2016)'s classification. Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

geographical proximity.[17] In our sample period, imports from these countries rose by an average of 9.9 percent per year, only slightly below the Chinese figure (10.3). Hence, we redefine ΔIC_{it} in equation 2.1 so as to include in ΔM_{kt}^{ITA} also imports to Italy from Central and Southeastern Europe, while keeping the instrument group unchanged. Column 4 indicates that broadening the set of sending countries does not alter our results. Another potential drawback of our key regressor is related to the set of importing countries. Proxying the trade shock with Chinese import penetration within a single country might makes more sense in case of an economy that exhibits a very large internal market. The US, for example, seems to meet this requirement fully. When it comes to smaller developed countries, like Italy (or Germany or France), this implicit assumption is no longer obvious, and it would be reasonable to assume that competition with low-wage exporters actually takes place within a wider market. Therefore, we re-compute ΔIC_{it} in equation 2.1 by including in ΔM_{kt}^{ITA} also imports from China to Italy's top five export destinations in 1992.[18] The estimated effect of the trade shock continues to hold (column 5). Still, a further issue with the trade exposure indicator regards the normalization of the change in imports from China. In the baseline equation 2.1 we follow Autor et al. (2013) and divide import change by employment in Italy in sector *k* measured at the beginning of the decade. In column 6, instead, imports are divided by absorption (internal production + imports – exports at the sector level) at the start of the decade, along the lines of Autor et al. (2016). The coefficient of interest is again positive and statistically very significant. The last concern about the import exposure measure is that we are not capturing the potential benefits of trade integration that may come from Italian exports to China. In Column 7, we substitute net Italian imports from China (imports – exports) for ΔM_{kt}^{ITA} and the main result is unaffected.

[17] The list of countries includes Czech Republic, Hungary, Poland, Slovak Republic, Slovenia, Bulgaria, Croatia, Romania, Albania, Bosnia and Herzegovina, Kosovo, FYR Macedonia, Montenegro, and Serbia. At the end of the 1980s, they represented a relatively small (but not irrelevant) share of Italian imports (3 per cent); in 2013, at the end of our sample period, this share had grown considerably reaching 9 per cent.

[18] Germany, France, the US, Great Britain and Spain. In 1992, the share of total Italian exports to each country was above 5 percent and the cumulative share was 54 percent.

Finally, the remaining three columns in Table 2.2 deal with some additional issues. Between 1992 and 1994, Italy witnessed the outbreak of the so-called Mani Pulite scandal, a judicial investigation into political corruption. As a result of this scandal, the political system underwent a deep transformation, with the disappearance of many traditional parties including the Christian Democracy (*Democrazia Cristiana*), the main party since the end of WWII, and the Socialist Party (*Partito Socialista*), which played a very important role in supporting the former during the eighties. The 1992 election (the first one in our sample) was the last election of the long-established First Republic; from the 1994 election onwards, new forces joined the political arena, among which was Berlusconi's party. In column 8, we document that our findings are robust to the exclusion of the 1992 election from the sample. Column 9 is concerned with the spatial units of analysis. As stated in the introduction, we argue that our very detailed breakdown allows us to exploit a very large portion of variability. However, this might come with a cost: spillover effects among municipalities might be at work. For example, a certain trade shock may hit a municipality, but its effects may spread outside that municipality because of local production ties and worker mobility. In the end, spillover may bias parameter estimates. To ensure that this is not the case, we aggregate all relevant variables at the level of 611 local labor markets (with an average size equal to around 97,000 inhabitants), which are much more self-contained units than municipalities as their boundaries are defined on the basis of daily commuting patterns, so minimizing the risk of spillover effects. Again, our key estimate is undoubtedly confirmed. Lastly, in column 10, we augment the baseline specification with area × trend fixed effects and results are once more largely reassuring.

Confounding factors. So far, we have shown that China's surge in international trade has favored the spread of populism. However, import competition from low-wage countries may be only part of the story: during the period under examination, three concurrent shocks may also have induced a populist reaction in the Italian electorate. The first is the other major facet of the ongoing globalization process, namely the increasing international migration toward rich countries. Hostility to

immigration is justified by populist parties on the basis of the perception that foreigners pose a threat to jobs and livelihoods and a challenge to national cultures and identities. The second is the introduction of the euro in 1999. According to the anti-euro rhetoric - which, not surprisingly, has been largely embraced by the Five Star Movement and by the Northern League – the end of competitive currency devaluation harmed Italian exporters, generating unemployment in exporting sectors. The third shock is the fiscal consolidation that took place in Italy during the sovereign debt crisis and culminated in the fiscal compact package passed by the Italian Parliament in 2012. Here, the populist argument is that the Italian recession, or its unsatisfying recovery rate during or after the sovereign debt crisis, depends in a nondemocratic way on the will of unknown, not-elected bureaucrats working for the European Union who apply rigid fiscal rules that ultimately harm people's well-being. In all three cases, there exist competing factors that might be captured by trade globalization.

In Table 2.3, we address this issue by including in the right-hand side of equation 2.2 proxies for the confounding factors to see whether our results on import competition will survive.

The role of immigration is taken into account with:

$$\Delta\left(\frac{Immigrants}{Natives}\right)_{it}$$

that is, the annual average change of the share of immigrants over native population at the municipality-year level. Data come from Istat and refer to regular immigrants. Unfortunately, this variable is available only from 2001 onwards. The expected sign is positive.

Exposure to the euro is measured as follows:

$$\sum_{k} \frac{L_{ikt_0}}{L_{it_0}} (1 - \vartheta_k)\, \Delta REER_t$$

$\Delta REER_t$ is the average annual growth rate of Italy's real effective exchange rate over a parliamentary term (a positive value indicates appreciation and, so, loss of competitiveness). Data on $REER_t$ are taken

from the Bank of International Settlements.[19] To map the country-level exchange rate shock to sectors, we assume that activities with low human capital content are more sensitive to price competition, in accordance with Bugamelli et al. (2010). Specifically, ϑ_k is the skill intensity in manufacturing sector *k* as reported by the same authors.[20] Local exposure is then retrieved, in parallel with equation 2.1, by taking a weighted summation of the industry-level changes, where the weights reflect the start-of-decade relative importance of each sector in a given municipality.[21] The expected sign is positive.

Exposure to fiscal austerity is given by:

$$\sum_k \frac{L_{ikt_0}}{L_{it_0}} \rho_k I_{[t \geq 2013]}$$

$I_{[t \geq 2013]}$ is a dummy variable equal to one since 2013, the year in which the Fiscal Compact came into force in Italy. This country-level fiscal shock is apportioned to industries according to their dependence on public spending. Specifically, ρ_k is the share of the final demand for products from tradeable sector *k* incurred by the public administration, as it results from the 2005 Input-Output accounts released by Istat. Municipality-level vulnerability is derived again, in parallel with equation 2.1, by exploiting the local heterogeneity in the industry mix. The expected sign is positive.

A general overview of Table 2.3 is largely reassuring: the effect of import competition is always positive and statistically significant so signaling that our key regressor is not picking up the impact of some confounding factor. In more detail, the first three columns show that the confounders enter the regression with the expected (positive) sign, even if the

[19] The BIS real effective exchange rate of a country is a geometric trade-weighted average of its bilateral exchange rates, adjusted by relative consumer prices (for details, see Klau and Fung, 2006).

[20] To avoid potential endogeneity issues, Bugamelli et al. (2010) compute the sectoral skill content measure for the US, based on the assumption that skill content is largely a technological characteristic and the level of development of euro area member states is comparable to that of the United States.

[21] The summation is over manufacturing sectors, the only ones for which the skill intensity is available.

estimation of the immigration parameter lacks precision[22]. In the last two columns, we enter all confounding factors simultaneously and our estimates are largely confirmed. In any case, the effect of import competition remains unchanged.[23]

Table 2.3: Confounding factors – immigration, euro and fiscal austerity

	(1) Immigration	(2) Euro	(3) Austerity	(4) All	(5) All
Δ(import exp.)	0.0132	0.0160	0.0253	0.0122	0.0163
	(0.0061)**	(0.0079)***	(0.0079)***	(0.0058)**	(0.0061)***
Δ(immigrant share)	0.1383			0.1073	
	(0.0954)			(0.0931)	
Δ(exp. to euro)		0.3787			0.3888
		(0.0606)***			(0.0606)***
Δ(exp. to fiscal compact)			0.1549	0.2135	0.1714
			(0.0219)***	(0.0275)***	(0.0227)***
First Stage:					
IVΔ(import exp.)	0.1007	0.1066	0.1168	0.1001	0.1068
	(0.0125)***	(0.0140)***	(0.0179)***	(0.0122)***	(0.0141)***
F-stat excl. instr.	64.95	57.73	42.76	66.99	57.49
Period FE	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Election years	2001-2013	1992-2013	1992-2013	2001-2013	1992-2013
Estimation method	IV	IV	IV	IV	IV
Observations	24,044	48,072	48,072	24,044	48,072

The dependent variable is the average annual change in the populist vote share between two elections. Votes are categorized as populist following Inglehart and Norris (2016). Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

Additional findings on protest vote. In order to provide a more complete picture, it is worth investigating the possibility that import competition from China might, not only have shifted votes toward

[22] This result is actually consistent with Caselli et al. (2018), who show that the lack of a significant relationship between the change in the local presence of immigrants and the change in the vote share of far-right parties is due to potential endogeneity issues.

[23] Because of the data limitation stated above, regressions including immigrants are run using only elections from 2001 onwards. Even in this subsample, the trade shock in the benchmark specification has a positive and statistically significant parameter (0.0132, standard error 0.0062).

populist parties, but also have triggered some other forms of protest vote.

Table 2.4 parallels Table 2.1. Panel A shows the results for regression 2.2 with the average annual change of the share of invalid (blank and null) ballot papers as the dependent variable. It turns out that Chinese import competition exerts a positive and highly significant effect on invalid ballot papers, which is known to be an alternative manner of protesting against politics and politicians. In Panel B, we replicate the same exercise using voter turnout – a well-celebrated determinant of the quality of the democratic process – as the outcome variable and find a negative and significant effect. In both cases, the economic size of the impact is non-negligible: the estimates reported in the last column imply that a one-standard deviation increase in the change of the trade shock implies a variation in the dependent variables that is 7 percent (for invalid ballots) or 5 percent (for turnout) of the respective standard deviations.

Table 2.4: Additional findings - invalid ballots and voter turnout

	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: invalid ballots			
Δ(import exp.)	0.0002	0.0016	0.0037	0.0004	0.0025	0.0065
	(0.0005)	(0.0005)***	(0.0007)***	(0.0004)	(0.0006)***	(0.0015)***
			Panel B: voter turnout			
Δ(import exp.)	-0.0047	-0.0050	-0.0075	-0.0017	-0.0020	-0.0055
	(0.0012)***	(0.0012)***	(0.0015)***	(0.0011)	(0.0010)*	(0.0016)***
First Stage:						
IVΔ(import exp.)				0.1368	0.1339	0.1164
				(0.0235)***	(0.0228)***	(0.0177)***
F-stat excl. inst.				33.99	34.63	43.11
Period FE	Y	Y	Y	Y	Y	Y
Area FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y
Election years	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013	1992-2013
Est. method	OLS	OLS	OLS	IV	IV	IV
Observations	47,992	47,992	47,983	47,992	47,992	47,983

In Panel A, the dependent variable is the average annual change in the share of invalid ballots between two elections. In Panel B, the dependent variable is the average annual change in voter turnout between two elections. Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

2.5 Labor market as the transmission channel

We have established that the rise in Chinese trade generates an increase in the share of votes for populist parties, along with an increase in the share of invalid ballots and a drop in voter turnout. Instrumental variable estimations ensure that these relationships have a causal interpretation. According to the economic theory outlined in the Introduction, the transmission channels should be concerned with the redistributive effects of trade between and within countries: developed countries suffer from the upsurge of low-wage emerging exporters such as China and the negative impact is likely to affect more strongly domestic workers whose degree of substitutability for workers in low-wage countries is larger. In this Section, we test whether these channels are at work in our case study. We proceed in two steps. First, we assess the between-country channel by checking whether import competition from China has a negative impact on employment and income in Italian municipalities. Second, we use various municipality-year level measures of income inequality as dependent variables to shed some light on the within-country mechanism.[24]

Effects on employment and income. In order to study the employment effects of the exposure to Chinese imports, we borrow from Autor et al. (2013) and run a slightly modified version of equation 2.2:[25]

$$\Delta EMP_{it} = \beta \Delta IC_{it} + X'_{it-10}\gamma + \delta_t + \gamma_{r(i)} + \varepsilon_{it} \qquad (2.4)$$

where i indicates municipalities and t denotes Census years (2001, 2011). ΔEMP_{it} is the ten-year change of total employment as a share of the

[24] Dippel et al. (2017) present a simple framework that allows to assess the extent to which the effect of import exposure on voting behaviour is causally mediated by the effect of import exposure on labour markets.

[25] We first checked whether replicating the benchmark regression only for elections held in 1992, 2001 and 2013 (those nearest to the Census years) yields estimates that are similar to the full-sample case. It turns out that this is the case: in the IV specification with all controls, the coefficient is 0.0045 (standard deviation 0.0015).

working age population. ΔIC_{it} is the trade shock as defined in equation 2.1, with n now equal to 10; the instrumental variable is adjusted accordingly. δ_t, $\gamma_{r(i)}$ and X_{it-10} are defined as above.

Results are reported in Table 2.5. Both OLS and IV coefficients suggest a negative and significant impact of Chinese import penetration on total employment. According to the IV estimate in column 6, the magnitude of the impact is not negligible: a one-standard deviation rise in the import exposure shock induces a drop in the dependent variable larger than one-fifth of its standard deviation. These results suggest that, even if China's competition affects the tradeable sectors only, negative effects are detectable at the total economy level as well, probably because of spillover effects.[26]

Table 2.5: Trade shock and total employment

	(1)	(2)	(3)	(4)	(5)	(6)
Δ(import exp.)	-0.0157	-0.0163	-0.0170	-0.0153	-0.0157	-0.0162
	(0.0021)***	(0.0021)***	(0.0024)***	(0.0034)***	(0.0035)***	(0.0038)***
First Stage:						
IVΔ(import exp.)				0.1908	0.1888	0.1748
				(0.0219)***	(0.0213)***	(0.0170)***
F-stat excl. inst.				76.24	78.55	105.42
Period FE	Y	Y	Y	Y	Y	Y
Area FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y
Census years	1991-2011	1991-2011	1991-2011	1991-2011	1991-2011	1991-2011
Est. method	OLS	OLS	OLS	IV	IV	IV
Observations	16,028	16,028	16,028	16,028	16,028	16,028

In Panel A the dependent variable is the 10-year change in manufacturing employment as a share of working age population. In Panel B the dependent variable is the 10-year change in total employment as a share of working age population. Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

In Table 2.6, we analyze the effects of the import exposure shock on income levels. Confidential data on average income levels at the

[26] In unreported evidence (available upon request) we replicate the estimation of equation 2.4 with manufacturing employment as the dependent variable. As expected, we find stronger effects of import competition than those reported in Table 2.5.

municipality level come from the Ministry of Economy and Finance and are based on tax records. Available years are from 2003 to 2014.[27] After adjusting income data for tax evasion, the estimating equation is analogous to previous ones and reads as:[28]

$$\ln(income)_{it} - \ln(income)_{it-1} = \beta \Delta IC_{it} + X'_{it_0}\gamma + \delta_t + \gamma_{r(i)} + \varepsilon_{it} \quad (2.5)$$

We find that the China import shock has a negative effect also on income, though the size of the impact is smaller than in the case of employment: the standardized beta in the last column is 0.01.

Table 2.6: Trade shock and income

	(1)	(2)	(3)	(4)	(5)	(6)
Δ(import exp.)	-0.0119	-0.0119	-0.0118	-0.0044	-0.0043	-0.0032
	(0.0014)***	(0.0014)***	(0.0014)***	(0.0006)***	(0.0005)***	(0.0005)***
First Stage:						
IVΔ(import exp.)				0.1574	0.1568	0.1514
				(0.0208)***	(0.0207)***	(0.0199)***
F-stat excl. instr.				57.39	57.28	57.91
Period FE	Y	Y	Y	Y	Y	Y
Area FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y
Census years	2003-2014	2003-2014	2003-2014	2003-2014	2003-2014	2003-2014
Est. method	OLS	OLS	OLS	IV	IV	IV
Observations	88,998	88,998	88,979	88,998	88,998	88,979

The dependent variable is the yearly change in log income. Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

[27] Unfortunately, available data refer to average income and not to wages. Then, assuming that the impacts of import competition on sources of income different from wage (e.g. rents, capital gains, etc.) are lower, our findings are to be considered as a lower bound for the effect on wage.

[28] Tax evasion is imputed using Marino and Zizza (2008) who compare Italian data from survey data with those from official tax records to propose tax evasion rate by gender, age, geographical area, job type (employee, self-employed, etc.). We map these rates into municipalities by means of their composition in terms of the same variable using data from the 2001 census. Then we correct original data by dividing them by 1 – (imputed tax evasion rate). As before, we first checked the benchmark result on populism by restricting the sample to the years for which income data are available. When we focus on elections held in 2006, 2008, and 2013, the IV trade shock coefficient is 0.0199 (standard error 0.0087).

All in all, results in Tables 2.5 and 2.6 are consistent with the theoretical prediction according to which Italy, as a rich and developed country, is a loser in trade globalization.

Effects on income inequality. Our last bunch of results is about the distributive effect of trade within country. Theory suggests that in developed countries trade can be detrimental/beneficial to low-/high-skilled workers. Our empirical framework can accommodate the test for this prediction: if it is true, one should observe an increase in wage inequality at the municipality-year level. The same confidential data on income include consistent data on the Gini index and on the shares of taxpayers whose income is above 75,000/120,000 euros (near the top 5/1 percent, respectively); all these measures allow us to study the effect either on the whole distribution (Gini) or on top incomes. The estimation approach follows model 2.5 except that our dependent variable is the change in one of the inequality measures.[29]

Table 2.7 reports our findings. The first three columns indicate that import competition is positively correlated with income inequality, and this evidence is robust to various definitions of the dependent variable as well as the functional form. However, these correlations can be given a causal interpretation only in the case of the full IV specification with the Gini index as the dependent variable (column 6 in Panel A), while the IV estimates obtained by measuring inequality with the share of high-income taxpayers are never significantly different from zero (columns 4-6 in Panels B and C).[30] In respect of our aim, failing to identify a robust causal link between import competition and inequality does not make the evidence in Table 2.7 useless. Voters are likely not to be so sophisticated and rational as to distinguish correlation from causality: they may well observe concomitant rising import competition and rising inequality and postulate a nexus between the two; such a nexus is then sufficient to translate into voting behavior.

[29] As far as inequality measures are concerned we cannot correct directly for tax evasion. Therefore, we give more weight to more reliable data by weighting regression with weights equal to 1 – (imputed tax evasion rate).

[30] This result is consistent with Malgouyres (2017a).

Table 2.7: Trade shock and income inequality

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: dependent variable = change in the Gini index						
Δ(import exp.)	0.0003	0.0005	0.0006	-0.0005	-0.0000	0.0004
	(0.0001)**	(0.0001)***	(0.0002)***	(0.0001)***	(0.0001)	(0.0002)**
Panel B: dependent variable = change in the share of taxpayers whose income is > 75,000 euros						
Δ(import exp.)	0.0012	0.0011	0.0013	0.0003	0.0002	0.0005
	(0.0003)***	(0.0003)***	(0.0003)***	(0.0004)	(0.0004)	(0.0004)
Panel C: dependent variable = change in the share of taxpayers whose income is > 120,000 euros						
Δ(import exp.)	0.0008	0.0007	0.0008	0.0001	0.0000	0.0002
	(0.0002)***	(0.0002)***	(0.0002)***	(0.0003)	(0.0003)	(0.0003)
First Stage:						
IVΔ(import exp.)				0.1574	0.1569	0.1514
				(0.0208)***	(0.0207)***	(0.0199)***
F-stat excl. instr.				57.56	57.45	58.06
Period FE	Y	Y	Y	Y	Y	Y
Area FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y
Years	2003-2014	2003-2014	2003-2014	2003-2014	2003-2014	2003-2014
Est. method	OLS	OLS	OLS	IV	IV	IV
Observations	88,998	88,998	88,979	88,998	88,998	88,979

In Panel A the dependent variable is the annual change in the Gini index. In Panel B the dependent variable is the annual change in change in the share of taxpayers whose income is > 75,000 euros. In Panel C the dependent variable is the annual change in the share of taxpayers whose income is > 120,000 euros. Standard errors are clustered at the level of 611 local labor markets. *Stars: * p<0.1; ** p<0.05; *** p<0.01.*

2.6 Conclusion

In recent years, populist parties have seen a surge in support in Western developed countries. We focus on the Italian case – one the most affected countries – and show that trade competition from low-wage countries and, in particular, from China contributes to causally explain the populist backlash. This result is confirmed after a number of robustness checks, including taking into account the competing role of immigration, the end of competitive devaluation, and the introduction of the fiscal compact. We further show that that protest vote also takes the form of an increase in invalid votes and a drop in voter turnout. To rationalize

these findings, we analyze the labor market effect of the China shock and find that it lowers employment and income and is positively correlated with income inequality, consistent with predictions from trade theory. More generally, and from a policy perspective, our results point to the deep root of the success of populist parties in Italy and suggest that fighting economic insecurity would be an effective tool to limit populist backlash.

2.7 Appendix

Table 2.A1: Descriptive statistics

Variable	Definition	Unit	Years/ Periods	Mean	Sd	Min	Max
Key regressor:							
Δ(import exposure)	avg annual change in imports per worker over a term	kUS$ 2000	1992-2013	0.062	0.145	-1.526	6.079
Istrumental variable:							
IV Δ(import exposure)	avg annual change in imports per worker over a term	kUS$ 2000	1992-2013	0.198	0.487	-2.971	52.459
Dependent variables:							
Δ (I&N populist vote share)	avg annual change in (populist votes / valid votes) over a term	share	1992-2013	0.011	0.039	-0.301	0.203
Δ (invalid ballot share)	avg annual change in (invalid ballots / total votes) over a term	share	1992-2013	0.001	0.011	-0.089	0.170
Δ (voter turnout)	avg annual change in (actual voters / potential voters) over a term	share	1992-2013	-0.008	0.017	-0.383	0.353
Δ (total employment share)	10-year change in (total employment / working-age population)	share	1991-2011	0.004	0.110	-2.810	2.423
Δ log (income)	avg annual change in anatural logarithm of income	% change	2003-2014	0.016	0.116	-1.414	1.102
Δ (gini index)	avg annual change in gini index	0-1	2003-2014	0.001	0.013	-0.234	0.294
Δ (top 75)	avg annual change in share of taxpayer with income > 75.000 €	share	2003-2014	0.002	0.023	-0.410	0.551
Δ (top 120)	avg annual change in share of taxpayer with income >120.000 €	share	2003-2014	0.001	0.018	-0.410	0.551
Controls:							
Coastal municipality	Dummy	0-1	2011	0.080	0.272	0	1
Measure of Territorial Roughness	(max altitude – min altitude) / √(surface km2/π)	meters	2011	230.2	234.3	0.332	2,088.3
Population density	population per square km	units	1991, 2001	274.9	623.4	1.188	15,165
Share of Famale Working-Age	women aged 15-64 / total population aged 15-64	share	1991, 2001	0.492	0.019	0.300	0.647
Share of Graduated Population	adults with at least high school diploma / total population	share	1991, 2001	0.204	0.079	0	0.706
Old Age Index	population aged > 64 / population aged < 15	ratio	1991, 2001	1.644	1.425	0.147	41.50
Share of Manufacturing	workers in manufacturing industries / total employment	share	1991, 2001	0.320	0.213	0	0.946

Table 2.A2: List of two-digit sectors

Sector (NACE revision 1)	Sector (description)	Import from China (Y/N)	Skill intensity	Dependence on public spending
01	Agriculture, hunting and related service activities	Y		0.00526
02	Forestry, logging and related service activities	Y		0.01494
05	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	Y		0.00000
10	Mining of coal and lignite; extraction of peat	Y		0.00000
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas	Y		0.00024
12	Mining of uranium and thorium ores	Y		
13	Mining of metal ores	Y		0.00000
14	Other mining and quarrying	Y		0.00014
15	Manufacture of food products and beverages	Y	0.16	0.00066
16	Manufacture of tobacco products	Y	0.27	0.00056
17	Manufacture of textiles	Y	0.10	0.00127
18	Manufacture of wearing apparel; dressing and dyeing of fur	Y	0.14	0.00022
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and	Y	0.09	0.00126
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of	Y	0.08	0.00213
21	Manufacture of pulp, paper and paper products	Y	0.17	0.00127
22	Publishing, printing and reproduction of recorded media	Y	0.34	0.00056
23	Manufacture of coke, refined petroleum products and nuclear fuel	Y	0.31	0.00007
24	Manufacture of chemicals and chemical products	Y	0.41	0.06580
25	Manufacture of rubber and plastic products	Y	0.15	0.00173
26	Manufacture of other non-metallic mineral products	Y	0.14	0.00127
27	Manufacture of basic metals	Y	0.14	0.00027
28	Manufacture of fabricated metal products, except machinery and equipment	Y	0.12	0.00072
29	Manufacture of machinery and equipment n.e.c.	Y	0.16	0.00280
30	Manufacture of office machinery and computers	Y	0.49	0.00262

Table 2.A2: List of two-digit sectors (continued)

Sector (NACE revision 1)	Sector (description)	Import from China (Y/N)	Skill intensity	Dependence on public spending
31	Manufacture of electrical machinery and apparatus n.e.c.	Y	0.21	0.00161
32	Manufacture of radio, television and communication equipment and apparatus	Y	0.36	0.01382
33	Manufacture of medical, precision and optical instruments, watches and clocks	Y	0.38	0.00700
34	Manufacture of motor vehicles, trailers and semi-trailers	Y	0.20	0.00505
35	Manufacture of other transport equipment	Y	0.33	0.01605
36	Manufacture of furniture; manufacturing n.e.c.	Y	0.16	0.00118
37	Recycling	N		0.00171
40	Electricity, gas, steam and hot water supply	Y		0.00030
41	Collection, purification and distribution of water	N		0.02431
45	Construction	N		0.00300
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	N		0.00008
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	N		0.00817
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household	N		0.02907
55	Hotels and restaurants	N		0.00539
60	Land transport; transport via pipelines	N		0.00390
61	Water transport	N		0.00195
62	Air transport	N		0.00383
63	Supporting and auxiliary transport activities; activities of travel agencies	N		0.03725
64	Post and telecommunications	N		0.00199
65	Financial intermediation, except insurance and pension funding	N		0.00098
66	Insurance and pension funding, except compulsory social security	N		0.00013
67	Activities auxiliary to financial intermediation	N		0.00001
70	Real estate activities	N		0.00006
71	Renting of machinery and equipment without operator and of personal and household goods	N		0.00117
72	Computer and related activities	N		0.00951

Table 2.A2: List of two-digit sectors (continued)

Sector (NACE revision 1)	Sector (description)	Import from China (Y/N)	Skill intensity	Dependence on public spending
73	Research and development	N		0.42225
74	Other business activities	Y		0.00050
75	Public administration and defence; compulsory social security	N		0.98660
80	Education	N		0.77876
85	Health and social work	N		0.75661
90	Sewage and refuse disposal, sanitation and similar activities	N		0.01252
91	Activities of membership organizations n.e.c.	N		0.01794
92	Recreational, cultural and sporting activities	Y		0.12070
93	Other service activities	Y		0.09299
95	Private households with employed persons	N		0.00000
99	Extra-territorial organizations and bodies	N		

Table 2.A3: List of populist parties by election

Election year	Parties labelled as populist
1992	Italian Social Movement – National Right (*Movimento Sociale Italiano – Destra Nazionale*); Lombard League (*Lega Lombarda*)
1994	Northern League (*Lega Nord*); National Alliance (*Alleanza Nazionale*)
1996	Northern League (*Lega Nord*); National Alliance (*Alleanza Nazionale*); Social Movement – Tricolor Flame (*Movimento Sociale – Fiamma Tricolore*)
2001	Northern League (*Lega Nord*); National Alliance (*Alleanza Nazionale*); Tricolor Flame (*Fiamma Tricolore*)
2006	Northern League (*Lega Nord*); National Alliance (*Alleanza Nazionale*); Tricolor Flame (*Fiamma Tricolore*)
2008	Northern League (*Lega Nord*); The Right – Tricolor Flame (*La Destra – Fiamma Tricolore*)
2013	Northern League (*Lega Nord*); Tricolor Flame (*Fiamma Tricolore*); The Right (*La Destra*); Brothers of Italy – National Alliance (*Fratelli d'Italia – Alleanza Nazionale*); Five Star Movement (*Movimento 5 Stelle*)

Chapter 3

Employment, turnover and profitability effects of the German national minimum wage: A sectoral analysis

3.1 Introduction

The desirability of minimum wage policy has been a heavily debated subject for over a century. On the one hand, setting a wage floor can ensure that those who work earn enough to live decently, if not comfortably (Macrosty, 1898). On the other, fixing the price of labour might unbalance supply and demand, leading to increased unemployment and the poverty risks that entails. There is still no consensus on the existence or size of this disemployment effect despite hundreds of papers already published on the subject, mainly based on state-level variation in the US.

The introduction of a national minimum wage in Germany on January 1st 2015 (€8.50/hr) is a welcome opportunity to obtain a fresh angle on the issue. As a major industrial economy, Germany is more comparable to other Western economies than say, Indonesia (Pratomo, 2016). The new wage floor is set at a level similar to that of long-established minimum wages in neighbouring countries, amounting to 48 percent of

the median wage[31]. Yet, given the extension of the German low-wage sector (Bosch, 2018) and the limited number of legal exemptions, its bite is considerable, with more than 50 percent of employees affected in certain sectors[32]. Unlike US studies, we are not limited to geography-level data, but can instead analyze firms directly thanks to our access to the nationally representative, firm-level database of Germany's largest credit rating agency.

The national character of the new minimum wage law means the panel techniques standard in the literature cannot be applied (e.g. Neumark and Wascher, 1992; Allegretto et al., 2013; Dube, Lester and Reich, 2010). Existing evaluation studies for Germany typically use difference-in-difference strategies relying on regional, individual-level or firm-level variation in the bite of the minimum wage (Caliendo et al, 2018). Instead, we propose here a different approach. First, we exploit differences in pre-treatment hourly wage levels across sectors to identify the effect minimum wages have on employment growth. Next, we link firms in heavily affected sectors to those in de facto unaffected sectors, matching on past employment paths and forward looking credit ratings. We surround the matching period by two testing periods (2011 and 2013-14) to evaluate our matching process.

Our results indicate that employment barely responded to the minimum wage introduction in Germany. Overall, employment growth of treated firms in the East was 0.8 percentage points lower than in the control group; in the West, the point estimate is indistinguishable from zero. In headcounts, this equates to just 21,482 jobs lost, or 0.05 percent of total employment. Even among micro firms in East Germany, we only found a reduction in employment growth of 1.8 percentage points.

Our results are largely in line with those of other evaluation studies. For example, Caliendo et al. (2018), exploiting regional differences in the intensity of minimum wage exposure, find a reduction in overall employment of 0.5 percent, concentrated amongst mini-jobbers[33]. Garloff

[31] Source: OECD (2018).

[32] Own calculations based on the German Socio-Economic Panel.

[33] The mini-job statute in Germany significantly reduces social security contributions for (very) low earning employees.

(2016) takes this approach one step further by creating region-age-gender cells, each with specific minimum wage bites and employment evolutions. He also finds no meaningful overall employment effect, only a shift from mini jobs to regular employment. Turning to survey data, Bossler and Gerner (2016) find that employment grew by 1.9 percent less in firms which reported having employees paid less than €8.50/hr in the 2014 IAB Establishment Panel. Relative to total employment that represents a reduction of about 0.15 percent.

The present chapter ties in to the wider international debate on the welfare effects of minimum wages and the discussion on which mechanisms could explain the lack of employment effects found in some studies (e.g. Cengiz et al., 2018; Allegretto et al., 2013; Dube et al., 2016) but not in others (e.g. Neumark and Wascher, 1992; Liu et al., 2016; Neumark et al., 2014). In addition to non-compliance (Burauel et al., 2017), increased unpaid overtime (Burauel et al., 2017) and lower working hours (Burauel et al., 2018), other adaptation strategies may also have been at work in Germany. Our estimates suggest that a part of the cost shock is absorbed by higher turnover, either through firms raising prices or wealthier consumers leading to more product demand. This corroborates existing studies in the US (Aaronson, 2001; Allegretto and Reich, 2018), Hungary (Cengiz et al., 2018) and Germany (Link, 2018). Moreover, we also show that credit ratings deteriorate in the West, suggesting the presence of monopsonistic labour markets in the restaurant and accommodation sectors, with minimum wages eating into firm profits (Bachmann and Frings, 2017). In the more diverse group of treated sectors in the East, instead, we find that credit ratings actually improve, contrasting with Draca et al. (2011), who find that the national minimum wage introduced in the UK in 1999 lowered profitability of affected firms by 2.7 percent.

The remainder of the chapter is organized as follows. Section 3.2 outlines the institutional background of the minimum wage reform, describes the data used for the empirical analysis and sets out the identification strategy we rely on. Section 3.3 presents our estimation strategy and the results so obtained for the employment effects. Section 3.4 discusses potential complementary adjustment mechanisms to the labour cost shock. Section 3.5 concludes and Section 3.6 provides supporting details.

3.2 Data and institutional context

3.2.1 Institutional context

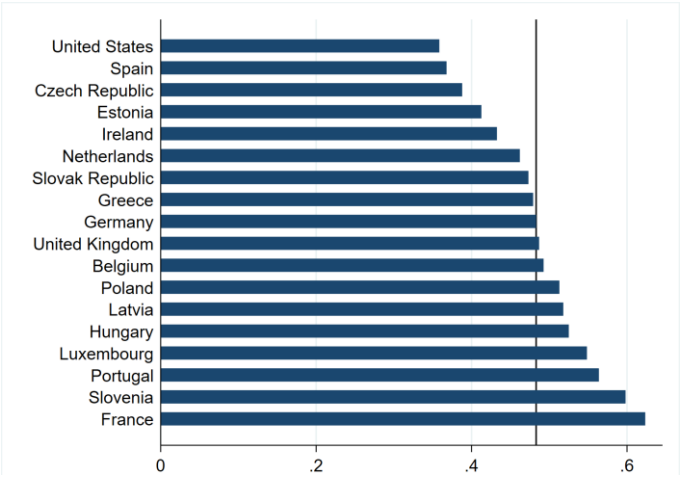
Western Germany has a long tradition of collective bargaining systems, which kept wages relatively high until the 90's. However, the reunification with deindustrialized Eastern Germany and increased international competition led to the introduction of opening clauses enabling deviations from binding industry-level collective agreements in the field of working time and wages (Schnabel, 1999). Together with the opening up of many public services to private providers and the Hartz labour market reforms of 2003, these developments substantially eroded the collective bargaining system, dropping coverage rates from a near universal 85 percent in 1990 to barely 60 percent in 2013 (and not even 50 percent in the East) (Weinkopf, 2015). Trade unions, which initially favoured sector-level agreements, started pushing for a national minimum wage, but met heavy political resistance. At the time, Germany was still considered the sick man of Europe, with unemployment rates above 10 percent, only turning into an economic superstar from 2008 onwards (Dustmann et al., 2014). The surge in economic prowess also led to increased support for a national minimum wage, as rising GDP failed to lift wages for the bottom deciles.

The Social Democratic Party (SPD) forced the issue in 2013 by making their entry in the governing coalition conditional on the introduction of a national minimum wage (Weinkopf, 2015). The Minimum Wage Act went into force on January 1st 2015, setting a national wage floor of €8.50 (then $11.05) and strengthening collective agreements (exceeding the national minimum). There are only very few exceptions: mainly interns[34], minors, trainees, volunteers and previously long-term unemployed during their first six months in a new job. Additionally, sectors with existing minimum wages below €8.50 (e.g. meat processing, hair dressing) were granted a two-year transition period. We exclude those from our analysis.

[34] Excluded are those with a compulsory internship, a voluntary orientation or a voluntary accompanying internship lasting less than three months or an entry-level qualification..

Figure 3.1 shows that Germany's National Minimum Wage (NMW) is set at a similar (relative) level as those present in other countries. About 2.8 million eligible employees earned less than €8.50 per hour in 2014 (11 percent, Burauel et al., 2017), albeit with sizeable differences across sectors and regions (see Table 3.A1). Own back of the envelope calculations based on the SOEP suggest that full compliance with the NMW would raise the average wage of affected employees by €2.41/hr. This would increase the total wage bill across Germany by 2 percent.

Figure 3.1: Ratio of minimum wage to median wage, 2015



Source: OECD (2018)

The future evolution of the policy is decided upon by the minimum wage commission, which consists of voting representatives from industry (3), unions (3) and two advisory members from the academic community. This led to a first increase in 2017, when the minimum wage was raised from €8.50 to €8.84, suggesting the minimum wage will be raised gradually (the 2017 hike amounts to a 4 percent increase) rather than in larger discrete jumps as more customary in the US[35].

[35] The average size of minimum wage changes in the US between 1990 and 2013 was 9.5 percent (Wursten, 2017).

3.2.2 Firm-level data

The core of this study is the Mannheim Enterprise Panel (MUP) hosted by ZEW – Leibniz Centre for European Economic Research. It is based on data obtained from Creditreform, the largest credit rating agency in Germany and covers all German corporations (Vanhaverbeke, 2017). The dataset is representative for the German economy and can thus be used to formulate population-level conclusions (Bersch et al., 2014). The main variables of interest are employment and turnover, but also the assigned credit ratings. These are based on a combination of public and private sources, e.g. public trade registers and court filings as well as private data on payment reliability and even manager interviews. As a result, these ratings contain more information on a firm's health than traditional balance sheet items: financial and liquidity risks and structural risks such as industry classification, firm age, firm size and productivity, along with "soft factors" such as payment history, volume of orders, firm development or management quality (Czarnitzki and Kraft, 2007). We drop outliers based on changes in the credit rating and employment or turnover (depending on the dependent variable) to retain the largest and smallest firms but still filter out input errors as well as major swings due to mergers and acquisitions.

3.2.3 Sector-level treatment indicator

Our identification strategy is based on comparing firms in heavily affected sectors to similar counterparts in largely unaffected sectors. In order to construct this 'vulnerability' indicator, we turn to the German Socio-Economic Panel (SOEP version 32), a yearly survey of private households, which has been conducted since 1984 in West Germany and since 1990 in East Germany (comparable to the Current Population Survey in the US). Crucially, it contains monthly wages as well as hours worked information, which we combine to obtain an estimate of each individual's hourly wage. Restricting our sample to eligible employees in 2013-2014, we can then calculate for each two-digit sector[36] how many

[36] We use the NACE revision 2 classification, which is based on the international ISIC standard and can fairly easily be compared to the US NAICS system.

employees were earning less than the €8.50 right before the minimum wage introduction. Given the substantial wage differences between East and West Germany, we further split this across the two regions.

Table 3.A1 provides an overview of the most and least affected sectors. As in the US, we can see that the food and beverage services sector is most heavily affected. Unaffected sectors are, for example, waste collection, financial services and the higher value manufacturing sectors. The table also shows the average gap between the sub-NMW earners' wage in 2014 and the NMW, and how much that sector's total wage bill would rise under full compliance (and no other wage movement).

We use the share of sub-NMW workers to split the industries into three groups: treated, grey zone and controls, for East and West Germany separately. Any sector where this share exceeds 30 percent is defined as treated, below 10 percent is considered control. Those in between we consider to be in the grey zone and exclude from the analysis. Table 3.1 shows the treatment allocation per sector-region (region: East or West Germany), as well as the corresponding distribution of firms in our regression sample. The differences between East and West Germany are remarkably stark. Only the 'restaurant' and accommodation sectors (NACE revision 2 codes 56 and 55) are treated in the West, whereas only seven sectors qualify as controls in the East. Conversely, there are 29 treated sectors in the East and 27 control sectors in the West.

3.3 Estimation

Our main aim is to assess the causal impact of the new German national minimum wage on employment growth over 2014-2015 and 2014-2016.[37] Formally, let $Treat_i$ be a dummy variable, which is equal to one if firm i is in a treated sector for its region and zero otherwise. Denote by ΔY_{it}^1 the

[37] We use 2014 as base year for both 2015 and 2016 because ultimately we want to test whether there was an effect at all and are less interested in seeing whether this effect differed between 2015 and 2016.

Table 3.1: Treated, untreated and greyzone sectors

Nace Code	Treatment West- East	# of Firms West- East	Nace Test
56	T-T	1018 - 124	Food and beverage service activities
55	T-T	626 - 158	Accommodation
47	GZ-T	9149 - 1255	Retail trade. excl. of motor vehicles and motorcycles
70	GZ-T	6270 - 313	Activities of head offices; management consultancy activities
45	GZ-T	4646 - 1017	Wholesale and retail trade and repair of motor vehicles and motorcycles
68	GZ-T	4066 - 605	Real estate activities
71	GZ-T	2702 - 454	Architectural and engineering activities; technical testing and analysis
52	GZ-T	2021 - 309	Warehousing and support activities for transportation
82	GZ-T	1670 - 169	Admin, office support and other business support activities
66	GZ-T	1509 - 160	Activities auxiliary to financial services and insurance activities
10	GZ-T	1233 - 257	Manufacture of food products
77	GZ-T	968 - 236	Rental and leasing activities
23	GZ-T	881 - 202	Manufacture of other non-metallic mineral products
73	GZ-T	987 - 68	Advertising and market research
69	GZ-T	874 - 99	Legal and accounting activities
79	GZ-T	763 - 81	Travel agency, tour operator and related activities
74	GZ-T	746 - 51	Other professional, scientific and technical activities
31	GZ-T	625 - 89	Manufacture of furniture
93	GZ-T	506 - 65	Sports activities and amusement and recreation activities
13	GZ-T	352 - 72	Manufacture of textiles
78	GZ-T	317 - 31	Employment activities
11	GZ-T	272 - 29	Manufacture of beverages
95	GZ-T	215 - 44	Repair of computers and personal and household goods
14	GZ-T	171 - 18	Manufacture of wearing apparel
80	GZ-T	130 - 21	Security and investigation activities
63	GZ-T	118 - 8	Information service activities
15	GZ-T	68 - 10	Manufacture of leather and related products
50	GZ-T	53 - 5	Water transport
12	GZ-T	11 - 1	Manufacture of tobacco products
64	C-C	956 - 51	Financial service activities. excl. insurance and pension funding
38	C-C	608 - 219	Waste collection, treatment and disposal activities; materials recovery
35	C-C	652 - 167	Electricity, gas, steam and air conditioning supply
37	C-C	108 - 34	Sewerage
84	C-C	106 - 18	Public administration and defence; compulsory social security
39	C-C	37 - 4	Remediation activities and other waste management services
43	C-GZ	15765 - 3844	Specialised construction activities
25	C-GZ	4969 - 964	Manufacture of fabricated metal products, excl. machinery and equipment
41	C-GZ	3159 - 772	Construction of buildings
28	C-GZ	3102 - 392	Manufacture of machinery and equipment n.e.c.
62	C-GZ	2603 - 250	Computer programming, consultancy and related activities
26	C-GZ	1180 - 170	Manufacture of computer, electronic and optical products
42	C-GZ	796 - 297	Civil engineering
27	C-GZ	898 - 144	Manufacture of electrical equipment
32	C-GZ	834 - 110	Other manufacturing
20	C-GZ	594 - 86	Manufacture of chemicals and chemical products
85	GZ-C	536 - 95	Education
33	C-GZ	464 - 124	Repair and installation of machinery and equipment
24	C-GZ	498 - 71	Manufacture of basic metals
29	C-GZ	339 - 68	Manufacture of motor vehicles, trailers and semi-trailers
17	C-GZ	329 - 49	Manufacture of paper and paper products
30	C-GZ	135 - 32	Manufacture of other transport equipment
21	C-GZ	124 - 19	Manufacture of basic pharmaceutical products and preparations
65	C-GZ	105 - 4	(re-)Insurance and pension funding, excl. compulsory social security
36	C-GZ	36 - 21	Water collection, treatment and supply
51	C-GZ	18 - 0	Air transport
9	C-GZ	6- 3	Mining support service activities
6	C-GZ	3- 0	Extraction of crude petroleum and natural gas

T: treated, C: control, GZ: grey zone (excluded). Table sorted by treatment status and number of firms in the sector. Unlisted sectors are a) in grey zone in both areas, b) excluded based on legislative reasons or c) excluded due to pre-existing higher sectoral minimum wage agreements.

observed change in the outcome value for treated firm i at time t and by ΔY_{it}^0 the potential change in the outcome value that the same firm would have observed at time t in the absence of the minimum wage introduction. The key parameter of interest is the average effect of treatment on the treated (ATT):

$$\alpha = E[\Delta Y_{it}^1 - \Delta Y_{it}^0 | Treat_i = 1], \qquad t = 2015, 2016 \tag{3.1}$$

where $E[\cdot]$ represents the expectation operator.

However, the term $E[\Delta Y_{it}^0 | Treat_i = 1]$ is not observable. While existing evaluation studies for Germany typically use a standard difference-in-difference approach to estimate the counterfactual situation, we apply here a difference-in-difference matching strategy (Heckman et al. 1997, 1998). The latter requires that, given a set of exogenous characteristics X, the change in the outcome value under control is (mean) independent of treatment status (unconfoundedness and overlap assumptions). Though being a "data-hungry" method, it provides a more convincing counterfactual comparison group (Ichino, 2014) by helping to balance covariates across treated and control firms. In addition, it allows to control, not only for unobserved time-invariant confounding factors, but also for unobserved covariates that are correlated with the observed ones (Smith and Todd, 2005a; Lechner, 2011).

More specifically, we implement nearest neighbour matching. This involves finding for each treated firm the closest control firm(s)[38] in terms of the Mahalanobis distance. To obtain the best possible match, a large pool of controls is required. Therefore, we employ matching with replacement and allow different treated firms to be matched to the same control firm. The risk that the closest neighbour is far away is avoided by excluding all treated firms whose smallest Mahalanobis distance is beyond the 95th percentile.

A tabular summary of our matching design can be found in Table 3.2. We always match on the level of log employment in 2012 and 2013 and on credit ratings in 2012, 2013 and 2014. This ensures that treated and control firms have a similar history in terms of both employment trends

[38] The set of control units matched to any treated unit is a singleton unless there are ties.

and projected survivability. Moreover, we also consider three additional covariates that optionally enter as matching variables, all measured in 2014: firm labour 'productivity' (turnover per employee)[39], state unemployment rate and share of mini jobbers in state total employment. The first would avoid that we match a three-man nail polishing shop to a multi-million financial activity. The two state-level matching variables proxy for particularities of local labour markets.

Table 3.2: Matching summary

Dependent Variables
Δ log(employment) (2014-15/16)
Matching Variables
log(employment) (2012, 2013)
credit rating (2012, 2013, 2014)
Matching Variables (optional)
firm 'productivity' (turnover/employment) in 2014
state unemployment rate in 2014
share of mini-jobbers in total state employment in 2014
Testing Variables
Δ log(employment) (2013-14)
log(employment) (2011)

We estimate the counterfactual with all possible combinations of the matching variables (6 in total) and select the specification that produces the smallest standardised difference in means (SDM) for the change in log employment between 2013 and 2014.[40] Hitherto, no study has found any anticipation effects of minimum wage changes, neither in Germany (e.g. Caliendo et al., 2018) nor in the US (e.g. Dube et al., 2010), implying that there should not be a treatment effect in 2014. In case of a tie, we

[39] If no productivity data for 2014 is available, we use the average of the last five years. If those aren't available either, we use the firm average over the entire available sample.

[40] The standardised mean difference of two variables is the difference in the mean of the variables, divided by the average of the two standard deviations. The SDM is less dependent on sample sizes than t statistics, which makes it more suitable for balance checks in matching procedures (Imbens, 2015).

look at the divergence in the SDM for the level of log employment in 2011. If these are still tied, we choose the most parsimonious option.[41]

ATT can then be estimated by the difference in the mean employment growth rate over 2014-t between the matched samples:

$$\hat{\alpha} = \frac{1}{N^T}\sum_{i \in T} \Delta Y_{it}^1 - \frac{1}{N^T}\sum_{i \in T}\sum_{j \in C(i)} w_{ij}\Delta Y_{jt}^0 \qquad (3.2)$$

$$w_{ij} = \begin{cases} 1/N_i^C & if\ j \in C(i) \\ 0 & otherwise \end{cases}$$

where T is the set of N^T treated observations, $C(i)$ is the set of N_i^C control units matched to treated unit i and $w_j = \sum_{i \in T} w_{ij}$ is the weight assigned to each control observation j, with $\sum_j w_j = N^T$. Standard errors are calculated as per Abadie and Gardeazabal (2003) and Abadie and Imbens (2006) in order to factor in matching uncertainty.

Table 3.A2 in the Appendix provides some baseline statistics about our sample, which contains 53,489 control firms and 10,257 treated ones. Start-ups and micro firms are overrepresented in the treated group relative to the (raw) control group. Treated firms' average employment grew faster since the introduction of the minimum wage (40 percent more employment growth than the controls), turnover grew more slowly in 2015, but by 2016 this trend had reversed. The credit ratings of treated firms improved (lower is better). Even though treated firms tended to be smaller, it is reassuring to see that their relative difference remained constant through 2012-2014 (-11 percent), which also applies to their turnover and credit ratings. Finally, treated firms tended to be in states with a higher unemployment rate and a higher share of mini-jobs. Thus, overall, the descriptive statistics show that the sample of treated firms is systematically different from the sample of control firms in both firm-specific and region-specific characteristics. This suggests that treatment assignment might not be statistically exogenous: after all, an inherent goal of the minimum wage introduction is to improve the income of low-wage workers in sectors and regions not covered by

[41] In Section 3.7 we show how intuition from multi factor error models and synthetic control methods can be used to justify this approach.

collective bargaining agreements (Weinkopf, 2015). Yet, our difference-in-difference matching strategy, by conditioning on pre-treatment observable covariates and by eliminating all time constant confounding unobservables, should mitigate the problem of endogeneity bias. Detailed pre-treatment checks will be provided on a regression-by-regression basis.

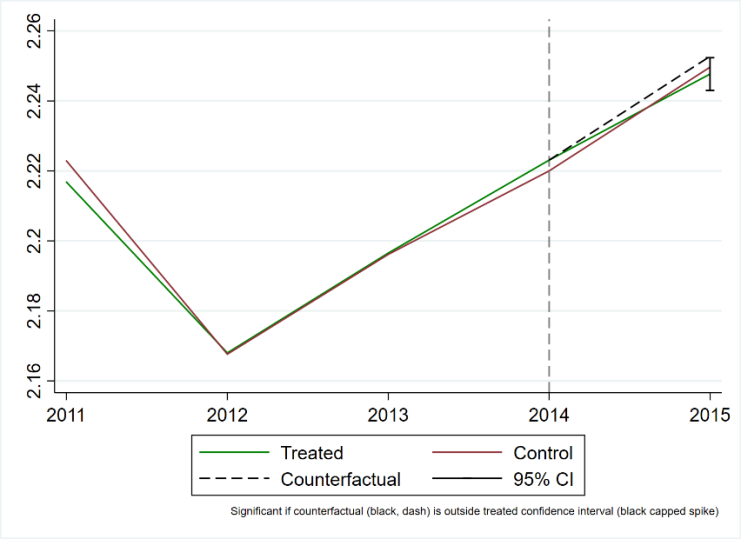
Our main results are shown in Table 3.3. In East Germany, we find a small negative impact on employment growth of 0.5 percentage points in 2015 and 0.8 percentage points by 2016 (column 1). On the other hand, in West Germany, where the treated firms belong to either the restaurant or the accommodation sector, employment remained stable, with insignificant results in both years (column 2).

Table 3.3: Employment effects

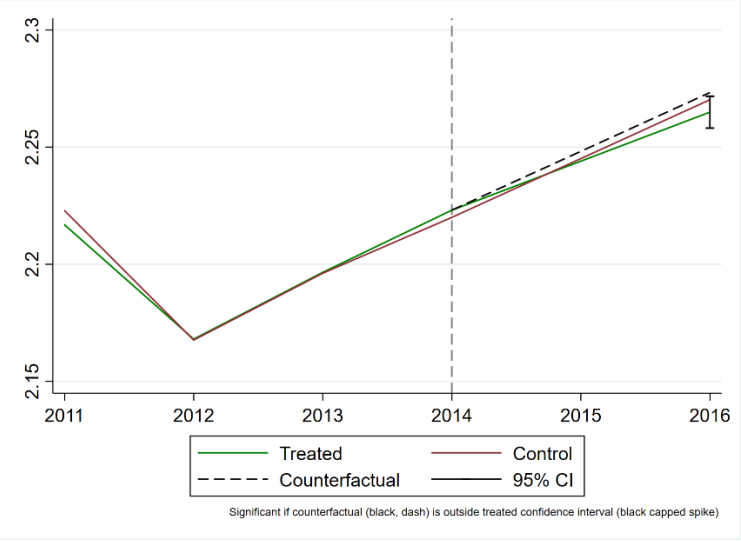
	East	West
	(1)	(2)
Δ Growth 14-15	-.005	.002
	(.002)**	(.004)
Δ Growth 14-16	-.008	.001
	(.003)**	(.006)
# of treated	5654	1562
# of controls	39012	39012
# of controls used	8008	2699
SDM 14-16	-.05	.01
SDM 14-15	-.04	.02
SDM 13-14	.02	.02
SDM 2013	0	.01
SDM 2012	0	.01
SDM 2011	0	.04
Trend Judgement	✓	✓
Specification	Base	Base

Δ Growth is the difference in growth between the treated and control group. SDM refers to the standardized difference in means. Specification shows which matching specification scored best at the evaluation criteria. Matching uncertainty robust AI standard errors in parentheses (Abadie and Imbens, 2006). *Stars: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Figure 3.2: Employment effect in East Germany



(a) Treatment effect 2014-15



(b) Treatment effect 2014-16

Estimates in Table 3.3 are derived from the base matching procedure (log employment in 2012, 2013 and credit ratings in 2012, 2013, 2014). In both regions the observed differences in employment growth from 2013 to 2014 are minute (0.02). Pre-treatment trends also match, as indicated by the checkmarks in the Trend 2011-2013 row. Figure 3.2 shows this graphically for employment in East Germany.[42]

Micro and small firms might be particularly affected by the minimum wage introduction given that it is harder for them to leverage capital in order to compensate for higher labour costs (it be due to lack of scope or access to funds). They might also struggle more with the extra bureaucratic burdens that came with the minimum wage legislation (Egeln, 2016). On the other hand, small firms might be less encumbered by internal protocols and hierarchy, which would make it easier for them to adjust their internal processes to new circumstances.

In Table 3.4 we zoom in on these micro and small firms (respectively, <10 and 10-49 employees). Except for small firms in the East, estimates are now obtained by matching also on different combinations of the optional covariates. Some regressions no longer perform well in the pre-treatment tests, as evidenced by the SDM 13-14 row and divergence over the SDMs of 2011/2012/2013. In the East, even our best estimate for employment growth of small firms still entails a meaningful difference in 2013-2014 growth (0.09, column 2) and the pre-treatment trends diverge. In the West, 2013-2014 growth differences remain minor (SDMs of -0.01 to 0.02), but pre-treatment trends for micro firms (column 3) are noisy enough to cast a small question mark on the credibility of the corresponding estimates.

Nevertheless, there is still evidence to suggest that the minimum wage effects are more extreme for smaller firms. Amongst micro firms in the East, employment growth was reduced by 1.8 percentage points (2 × the overall effect). Employment in small firms in the West even went up, indicating these sectors might be characterized by monopsonistic labour markets.

[42] In the Appendix, we also show unmatched difference in difference results (Table 3.A3); however, for some sample splits the pre-treatment trends are not ideal.

Table 3.4: Employment effects - micro and small enterprises

	East		West	
	Micro	Small	Micro	Small
	(1)	(2)	(3)	(4)
Δ Growth 14-15	-.009	.002	-.002	.019
	(.004)**	(.003)	(.008)	(.006)***
Δ Growth 14-16	-.018	-.001	-.007	.034
	(.006)***	(.005)	(.011)	(.009)***
# of treated	2875	2091	552	665
# of controls	39009	39012	39009	38908
# of controls used	3001	2534	512	610
SDM 14-16	-.09	-.01	-.04	.21
SDM 14-15	-.07	.01	-.01	.19
SDM 13-14	-.02	.09	-.01	.02
SDM 2013	-.27	.01	-2.4	.16
SDM 2012	-.28	.01	-2.41	.16
SDM 2011	-.28	.01	-2.15	.15
Trend Judgement	✓	x	?	✓
Specification	MJ	Base	MJ	P, U

See notes of Table 3.3. MJ: match also on the 2014 share of mini-jobbers in state total employment, P: … level of firm labour productivity, U: … state unemployment rate. *Stars: * p < 0.1, ** p < 0.05, *** p < 0.01.*

3.4 Discussion

Our employment estimates are in line with other existing studies of the German minimum wage. Bossler and Gerner (2016) find a reduction in employment of 1.9 percent in firms with at least one employee earning less than €8.50 based on the 2011-2015 IAB Establishment Panel. Likewise, in a later paper they find an employment effect of -1.7 percent by 2016, driven mostly by firms in the East and firms facing strong competitive pressure (Bossler et al., 2018). The approach in Caliendo et al. (2018) is more similar to ours, but they get their identifying variation from regional rather than sectoral differences in the minimum wage bite.

They find a much smaller effect on regular employment (-0.3 percent), but a significantly larger effect for mini-jobbers (-3.0 percent). This differential impact on regular versus marginal employment is also present in Garloff (2016), who uses region-age-gender variation in the minimum wage bite to identify the employment effect. They find that the number of mini-jobs lost balance out the gains in regular employment, suggesting there might be a shift from one form to the other. The pattern repeats itself in Bonin et al. (2018), who use a confidential employee-employer dataset to find an overall employment loss of -0.7 percent, driven exclusively by a drop in marginal employment (-0.9 percent) whereas regular employment even increased in their estimation (+0.4 percent).

In order to compare our results to the numerous ex-ante predictions, we first convert the relative employment loss to an absolute number of jobs foregone. In 2014, Germany counted 38 million employees[43]. Of those, 4.9 million were employed in an affected sector. We only find significant disemployment effects in the East (-0.8 percentage points growth), therefore we limit ourselves to the 2.2 million affected employees in the East. Our back-of-the-envelope estimate then suggests that 22,000 jobs were lost due to the national minimum wage. This represents a mere 0.05 percent of total employment and is in the same ballpark as the previously mentioned ex-post studies. It lies, however, far below most ex-ante predictions. The latter were generally clustered around a million jobs lost (Knabe and Schöb, 2008: 0.84 million; Ragnitz and Thum, 2007: 1.1 million; Bachmann et al., 2008: 1.2 million; Bauer et al., 2009: 0.85 million), with the notable exception of Müller and Steiner (2010), who predicted a more conservative 150,000 job loss. A potential explanation for this large discrepancy is that ex-ante studies were performed at a time when German unemployment was twice as high (10 versus 5 percent in 2014) and estimated wages in the bottom decile were much lower (Müller, 2013).

How can we explain this muted response to a significant policy shock?

Burauel et al. (2017) have shown that compliance with minimum wage

[43] Source: Destatis. Includes both regular and marginal employment, but excludes interns and the self-employed.

legislation was less than perfect: in 2014, an estimated 2.8 million people earned less than the NMW, by 2016 this number had only dropped to 1.8 million. Closely related, Burauel et al. (2017) also find an increase in unpaid overtime, which would further dampen the cost shock experienced by firms. A reduction in working hours instead of headcounts is another possibility (Burauel et al., 2018). We discuss here three additional potential adjustment mechanisms, by looking at the impact of the German minimum wage on the change in credit ratings - an indicator of firm profitability (Kraft et al., 2012) - and in log turnover over 2014-2015 and 2014-2016 (see Table 3.5 for matching design).[44,45]

Table 3.5: Matching design – credit rating and turnover regressions

Credit rating regressions	Turnover regressions
Dependent Variables	
Δ credit rating (2014-15/16)	Δ log(turnover) (2014-15/16)
Matching Variables	
credit rating (2012, 2013)	log(turnover) (2012, 2013)
log(employment) (2012, 2013, 2014)	credit rating (2012, 2013,2014)
Matching Variables (optional)	
firm 'productivity' (turnover/employment) in 2014	
state unemployment rate in 2014	
share of mini-jobbers in total state employment in 2014	
Testing Variables	
Δ credit rating (2013-14)	Δ log(turnover) (2013-14)
credit rating (2011)	log(turnover) (2011)

Table 3.6 documents that credit ratings in West Germany went up 1.08 points by 2016 (higher is worse). This finding suggests that owners absorbed some of the costs through lower profitability (column 4), which would hint to monopsonistic labour markets. There is some circumstantial evidence to support this claim. For instance, Bachmann

[44] In Section 3.7, we also show that the NMW doesn't lead to higher firm exit rates, although the matching provides credible estimates only in East Germany.

[45] Note that the various complementary adaptation strategies may work conditional on the level of the NMW chosen by the federal authorities.

and Frings (2017) find that the restaurant and accommodation sectors (the only treated ones in the West) show more traits of monopsonistic than of competitive labour markets. On the contrary, firms in the East appear to have come out of the minimum wage shock stronger, with credit ratings improving across the board (columns 1-3). Such enhanced profitability might be due to increased expected demand. Yet, the result is somewhat at odds with Bossler et al. (2018) who use accounting data to show that the NMW reduced profitability in affected firms by 8 percent (driven by higher labour costs). Unfortunately, they do not provide a regional split.

Table 3.6: Credit rating effects - all, micro and small enterprises

	East			West		
	All	Micro	Small	All	Micro	Small
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Growth 14-15	-.317	-.88	.519	.893	.572	.539
	(.306)	(.456)*	(.489)	(.457)*	(.685)	(.726)
Δ Growth 14-16	-1.566	-1.602	-1.373	1.083	.899	.556
	(.435)***	(.663)**	(.662)**	(.63)*	(.883)	(1.048)
# of treated	5965	3077	2184	1750	766	673
# of controls	42847	42847	42847	42847	42847	42847
# of controls used	4393	2233	1620	1628	758	621
SDM 14-16	-.1	-.1	-.08	.06	.05	.03
SDM 14-15	-.03	-.08	.04	.07	.04	.04
SDM 13-14	-.01	-.05	-.01	.03	0	.06
SDM 2013	-.01	-.01	-.01	0	0	0
SDM 2012	-.01	-.01	-.01	0	0	0
SDM 2011	-.04	-.03	-.06	-.02	-.06	.05
Trend Judgment	✓	?	?	✓	?	?
Specification	U	U	U	P	P	P

See notes of Table 3.4. *Stars: * p < 0.1, ** p < 0.05, *** p < 0.01.*

Table 3.7 reports estimates for the change in log turnover as dependent variable. While in East Germany turnover did not respond to the minimum wage hike, in West Germany it grew 1.1 percentage points

more among treated firms in 2015 and 3.3 percentage points more by 2016, with gains disproportionately going to micro and small firms. This pattern is consistent with positive price and demand effects.

Figure 3.7: Turnover effects - all, micro and small enterprises

	East			West		
	All	Micro	Small	All	Micro	Small
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Growth 14-15	-.001	-.006	-.005	.011	.026	.016
	(.004)	(.005)	(.005)	(.006)**	(.01)***	(.009)*
Δ Growth 14-16	-.003	.003	-.008	.033	.046	.043
	(.006)	(.008)	(.008)	(.009)***	(.018)**	(.013)***
# of treated	3981	1821	1401	1115	342	457
# of controls	27787	27785	27787	27788	27787	27788
# of controls used	2876	1579	1283	1090	328	471
SDM 14-16	-.01	.01	-.04	.16	.2	.21
SDM 14-15	-.01	-.04	-.03	.09	.2	.12
SDM 13-14	-.01	-.01	-.01	.02	-.01	.03
SDM 2013	-.01	-.27	.02	0	-.08	.02
SDM 2012	-.01	-.27	.01	0	-.08	.01
SDM 2011	0	-.3	.03	.02	-.15	-.01
Trend Judgement	✓	✓	✓	✓	x	✓
Specification	U	MJ	Base	P, U	P, U	Base

See notes of Table 3.4. *Stars: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

The price channel as an escape valve has a long line of supporting literature, both in the US (e.g. Aaronson, 2001; Allegretto and Reich, 2018) and beyond (e.g. Cengiz et al., 2018, for Hungary; Link, 2018, for Germany). Restaurant prices in particular, are relatively volatile, increasing by 2-3 percent yearly even in low general inflation periods.[46,47] Moreover, still with reference to the restaurant sector, we can observe

[46] Source: Destatis, Verbraucherpreisindex.

[47] In its 2018 Report, the Minimum Wage Commission highlights that there was exceptional price growth in both the Accommodation and Restaurant sectors (p. 138).

that: (i) 2015 saw a 12 percent decline in the number of people who never eat out as well as an increase in the number of people eating out often[48]; (ii) income effects in the lower deciles might have an outsized effect on restaurant demand given that expenditure on outside eating doubles when households go from earning less than €900 per month to earning between 1,300-1,500, which is what you would see if a full time worker went from an hourly wage of €5.5 to the new legislated minimum[49].

Our results put American studies into perspective: if the US restaurant sector[50] can adjust to higher minimum wages through similar mechanisms, the lack of disemployment effects found in that sector (e.g. Dube et al., 2010, Allegretto et al., 2011) cannot automatically be extrapolated to the wider economy.

3.5 Robustness checks

In our main results, we split firms into three groups based on the share of employees earning less than €8.50 per hour in 2013-2014. The thresholds, at 10 and 30 percent, were quite strict to ensure a clear distinction into treated and control. However, our lack of significant employment effects may depend on these specific thresholds, as well as this specific measure of the minimum wage bite.

As an alternative, we first shift these limits to 15 and 25 percent. This should reduce the variance of our estimate (as we have more data), but comes with the risk of introducing attenuation bias as (more) firms will now be assigned to the wrong treatment status.[51]

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[48] Source: Statista, https://www.statista.com/statistics/561124/eating-out-frequency-germany/, accessed April 2018.

[49] Source: Destatis, "Private Consumption Expenditure of Households, EVS"

[50] Due to the low level of the US minimum wage, no other meaningful sectors employ considerable numbers of potentially affected workers.

[51] Essentially, we introduce measurement error in the treatment variable, which would be our independent variable if we were in a standard regression framework.

Table 3.8 shows the results with the laxer treatment assignment. As expected, the estimates have become more precise, with standard errors slightly decreasing across the board and the coefficient estimates moving closer to zero. Nevertheless, by 2016 we still find evidence, in the East, for a small negative employment effect (-0.7 percentage points, column 1) and a moderate improvement of credit ratings (column 3) and, in the West, for a slight deterioration of the latter (column 6). Instead, we find no significant effect on turnover within the wider set of treated firms in the West (columns 2 and 5), which now belong also to retail trade (NACE revision 2 code 47), manufacture of food products and beverages (10, 11), and sports and recreation activities (93). Thus, the ability of firms to adapt to the NMW via turnover depends on sector-specific features.

Table 3.8: Employment, turnover and credit rating effects – smaller grey zone

	East			West		
	Emp	Turn	CR	Emp	Turn	CR
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Growth 14-15	-.003	-.002	-.093	-.001	-.004	.253
	(.002)	(.003)	(291)	(.002)	(.002)	(.159)
Δ Growth 14-16	-.007	-.006	-.716	0	-.005	.67
	(.003)**	(.005)	(.406)*	(.002)	(.003)	(.217)***
# of treated	6577	4706	7605	11552	8275	14294
# of controls	63385	45457	72600	63385	45460	72600
# of controls used	11881	4055	5766	17908	7111	12126
SDM 14-16	-.04	-.03	-.04	0	-.02	.04
SDM 14-15	-.02	-.01	-.01	-.01	-.03	.02
SDM 13-14	.02	-.01	-.03	.01	-.02	.01
SDM 2013	0	-.01	-.01	0	0	0
SDM 2012	0	-.01	0	0	0	0
SDM 2011	.01	-.02	-.02	0	0	-.02
Trend Judgement	✓	✓	✓	✓	✓	✓
Specification	Base	MJ	U	Base	P	P, U

See notes of Table 3.4 *Stars: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Second, our headcount based bite measure does not factor in distances to the NMW nor how important those sub-NMW employees are for the total wage bill of firms in that sector. As a check, we calculate two new measures. Gap, which measures how much average wages go up in euros under full compliance and no spillovers. And WBI, which indicates how much the total wage bill increases under the same scenario in relative terms. Table 3.9 provides an overview. For each measure, the sectors in the bottom quartile are taken as controls, the top quartile as treated[52]. The three measures lead to very similar treatment and control groups. 37 (32) sector-regions are considered treated (control) in all three. 5 (6) are treated in two and 5 (9) in one measure only. Figure 3.A1 in the Appendix illustrates this correlation graphically.

Table 3.9: Bite measure indicator overview

Name	Description	Information Used
Share	Share of employees earning less than NMW in 2013-14	Headcounts of wage above/below NMW
Gap	Average increase in hourly wage under full compliance and no spillovers	Sub NMW wages
WBI	Average increase in the total wage bill under full compliance and no spillovers	All wages

The resulting estimates are also quite similar as evidenced by Table 3.10 and Table 3.11. By 2016, the negative employment effect in East Germany is slightly larger under the gap-based measure (-1.1 percentage points, column 1 of Table 3.10) and of the same magnitude but insignificant under the WBI measure (-0.7 percentage points, column 1 of Table 3.11). Regardless of the treatment indicator used, turnover doesn't diverge, while credit ratings experience an improvement in 2016.

In the West, the Gap measure leads to a small negative employment effect (-0.8 percentage points, column 4 of Table 3.10), however, the pre-treatment trend for the estimation is shaky, though not necessarily

[52] The 10-30 percent thresholds we use in our main regressions corresponds very closely to this interquartile range for the share-based measure.

disqualifying; by 2016, growth in turnover is also 2.2 percentage points lower in the treated sectors than in the control group (column 5 of Table 3.10); credit ratings deteriorate in both years (column 6 of Table 3.10). The findings for West Germany based on average wage bill increases are more in line with the main results, seeing no employment effect (column 4 of Table 3.11), higher turnover growth (3 percentage points, column 5 of Table 3.11) and a deterioration of credit ratings in 2015 (column 6 of Table 3.11).[53]

Table 3.10: Employment, turnover and credit rating effects – Gap

	East			West		
	Emp	Turn	CR	Emp	Turn	CR
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Growth 14-15	-.008	-.002	-.057	-.006	.005	1.905
	(.004)**	(.004)	(.311)	(.002)***	(.007)	(.946)**
Δ Growth 14-16	-.011	-.003	-.735	-.008	-.022	2.527
	(.005)**	(.006)	(425)*	(.003)***	(.012)*	(1.277)**
# of treated	4966	3496	5781	10545	7554	13153
# of controls	36708	26501	41979	36708	26498	41977
# of controls used	3577	2604	4018	8164	1751	1772
SDM 14-16	-.06	-.01	-.05	-.05	-.11	.14
SDM 14-15	-.06	-.01	-.01	-.05	.04	.15
SDM 13-14	0	0	.01	.02	.01	.01
SDM 2013	-.01	-.01	-.01	0	-.14	.06
SDM 2012	-.01	-.01	-.01	0	-.14	.06
SDM 2011	-.02	-.03	-.05	0	-.15	-.01
Trend Judgement	✓	✓	✓	✓	✓	✓
Specification	U	P, U	U	P, U	P,U,MJ	P, MJ

See notes of Table 3.4 *Stars: * p < 0.1, ** p < 0.05, *** p < 0.01.*

[53] This is essentially a result of how similar the alternative treatment indicators are to the share-based measure: under the WBI measure, the only new treated sector in the West is sports and recreation activities (93); under the Gap measure, the added treated sectors in the West include retail trade (47), sports and recreation activities (93), programming and broadcasting activities (60), and gambling and betting activities (92).

Table 3.11: Employment, turnover and credit rating effects – WBI

	East			West		
	Emp	Turn	CR	Emp	Turn	CR
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Growth 14-15	-.005	.003	-.216	.001	.011	.689
	(.003)	(.003)	(.322)	(.004)	(.005)**	(.407)*
Δ Growth 14-16	-.007	0	-1.239	.006	.03	.593
	(.004)	(.005)	(.452)***	(.006)	(.009)***	(.569)
# of treated	6048	4316	6974	1701	1221	2192
# of controls	56440	40204	64532	56440	40204	64532
# of controls used	4920	4012	5742	2223	1200	2089
SDM 14-16	-.04	0	-.08	.04	.14	.03
SDM 14-15	-.04	.02	-.02	.01	.09	.05
SDM 13-14	.02	-.01	0	.01	.03	.03
SDM 2013	0	0	0	.01	0	.01
SDM 2012	0	0	0	.01	-.01	.01
SDM 2011	0	-.02	-.02	.03	.01	0
Trend Judgement	✓	✓	✓	✓	✓	✓
Specification	U	P	U	U	U	P

See notes of Table 3.4. *Stars: * p < 0.1, ** p < 0.05, *** p < 0.01*

3.6 Conclusion

In this chapter, we present a novel approach to analyse the employment growth effects of the national German minimum wage introduced on January 1st 2015. We start from individual hourly wages to determine which sectors were vulnerable to the new wage floor and which should remain unaffected. Then we turn to firm level data and match firms in treated sectors to similar firms in unaffected sectors. The richness of the (proprietary) dataset used allows us to not only match on past employment and turnover, but also on the firm's credit score evolution, which represents expectations about its future.

We find a very small employment effect in the East, suggesting employment in treated firms grew 0.8 percentage points slower than in their untreated counterparts, equivalent to 22,000 jobs lost. Micro firms (<10 employees) seem particularly affected, seeing 1.8 percentage points lower employment growth. In the West, employment remains stable. The overall conclusion remains the same if we use different thresholds or different bite measures.

We propose several complementary mechanisms which may have muted the disemployment effect of the minimum wage. In the West, the treated sectors have previously been found to have monopsonistic labour markets (Bachmann and Frings, 2017). Our finding that credit ratings (an indicator of firm profitability) deteriorated supports this theory. Moreover, the affected sectors in the West (restaurant and accommodation) are characterized by flexible prices and sell products set to profit from richer poor workers. These product demand and price effects might also be at play in the East, in line with findings in the international literature (e.g. Allegretto and Reich, 2018; Cengiz et al., 2018).

It is non-trivial to directly extrapolate these results to the US situation. For example, the product demand effects are unlikely to materialise in that context as minimum wages are so low that only a tiny fraction of the population is affected (Wursten, 2017). Nevertheless, the increase in turnover in the accommodation and restaurant sectors still adds a few Newton of support to the prices-as-escape-valve theory gaining ground in that debate. Moreover, although our results might not inform whether the small minimum wage changes observed in the US have been detrimental to employment, they do suggest that fears for dramatic job losses after the introduction of a living wage ($15/hour) are exaggerated. The same fears existed in Germany (ex-ante studies clustered around 1M job losses) but have so far not been vindicated. Instead, the National Minimum Wage led to robust wage growth (Bossler and Gerner, 2016) and at most very limited employment losses, and that only in particular sectors and regions.

3.7 Supporting details

Matching procedure justification. In line with synthetic control method studies (e.g. Abadie and Imbens, 2006; Dube and Zipperer, 2015), we assume that the outcome value for any firm i at time t, Y_{it}, can be modelled in a multi factor error structure (see e.g. Chudik and Pesaran, 2015; Bai, 2009) as follows:

$$Y_{it} = \alpha_i D_t Treat_i + c_i + \delta_t + F_t \lambda_i + \varepsilon_{it} \tag{3.3}$$

α_i is the firm-specific treatment effect. D_t is a dummy variable, which is equal to one from 2015 onwards and zero prior to the reform. c_i is a firm-specific fixed effect and δ_t is a period specific common shock. ε_{it} is a mean zero (time-varying) idiosyncratic shock. F_t is a time-varying economy wide shock that affects each firm differently, according to its specific factor loading λ_i. There can be a potentially large number of these, but, for ease of exposition, we stick to one.

Substituting our model for Y_{it} into equation 3.2 and expanding the difference operator yields:

$$\hat{\alpha} = \sum_{i \epsilon T} \left[\alpha_i + (c_i - c_i) + (\delta_{15} - \delta_{14}) + \lambda_i (F_{15} - F_{14}) + (\varepsilon_{i,15} - \varepsilon_{i,14})\right] - \sum_{j \epsilon C} w_j \left[\left(c_j - c_j\right) + (\delta_{15} - \delta_{14}) + \lambda_j (F_{15} - F_{14}) + \left(\varepsilon_{j,15} - \varepsilon_{j,14}\right)\right] \tag{3.4}$$

The c_i's drop out due to the time differing. Moreover, given that $\sum_{i\ in\ T} 1 = \sum_{j \epsilon C} w_j$, the deltas in treated and control also cancel out each other. Finally, the ε's are assumed to be mean zero, so that, as T and C get large, these drop out as well, leaving us with:

$$\hat{\alpha} = \sum_{i \epsilon T} [\alpha_i + \lambda_i (F_{15} - F_{14})] - \sum_{j \epsilon C} w_j \lambda_j (F_{15} - F_{14}) =$$

$$= \sum_{i \epsilon T} \alpha_i + \left(\sum_{i \epsilon T} \lambda_i - \sum_{j \epsilon C} w_j \lambda_j \right) (F_{15} - F_{14}) \tag{3.5}$$

The remaining bias terms are a function of the disparity in the treated and untreated factor loadings λ. This is where the synthetic control method intuition comes in: if we match on pre-treatment outcome values, then as T,C and the number of pretreatment periods we match on get larger, the average difference between treated and untreated factor loadings λ goes to zero. The idea is that with just one pre-treatment period you might still be able to find a set of weights w_j such that treated and untreated firms with different factor loadings match due to compensating idiosyncratic ε's. As the pre-treatment period becomes longer, this becomes increasingly unlikely (given time constant weights). Instead, this only remains possible if your matching algorithm achieved matches by picking controls firms such that the weighted sum of their factor loadings $\sum_{j\epsilon C} w_j\lambda_j$ equals the sum of the treated factor loadings $\sum_{i\epsilon T} \lambda_i$. Under that assumption, Equation 3.5 reduces to:

$$\hat{\alpha} = \sum_{i\epsilon T} \alpha_i \tag{3.6}$$

where all bias terms have been accounted for.

Exit rate analysis. We make a few changes to our methodology to accommodate the peculiarities of exit rates. First, we do not drop outliers as these might be disproportionately important in terms of exit probabilities. Second, we only match on employment and credit rating in 2012 and 2013, omitting the 2014 credit rating. This allows us to test whether there were divergences in exit rates in 2014 already. Finally, given that we match on non-zero employment in past years, we cannot judge whether exit rates in those years were similar. The dependent variable is the change in the existence status of the firm. It can take on two values: 0 if the firm's status did not change (still alive/still dead) or -1 if the firm left the market in the time period observed. For example, if the firm existed in 2013 and 2014, but not in 2015, then it would take on the value of 0 for Δ Existence 13-14, but -1 for Δ Existence 14-15 and Δ Existence 14-16.

Table 3.12 shows the results. In the East (column 1), we obtain credible pre-treatment results, with a SDM in 13-14 of only 0.01. The similarity

persists after the treatment, with no significant differences in existence rates (-0.001 by 2015, -0.002 by 2016). In the West, we find a significantly negative effect, suggesting that by 2016 an additional 3.9 percent of firms closed down. However, if we look at the SDMs, we see that similar differences were already observed between 2013 and 2014 (SDM of -0.11 versus -0.1/-0.14), implying the results for West Germany are not credible.

Table 3.12: Exit rate effects

	East	West
	(1)	(2)
Δ Existence 14-15	-.001	-.022
	(.003)	(.002)***
Δ Existence 14-16	-.002	-.039
	(.004)	(.003)***
# of treated	27253	14846
# of controls	134949	136070
# of controls used	17245	56017
SDM 14-16	-.01	-.14
SDM 14-15	0	-.1
SDM 13-14	.01	-.11
Trend Judgement	✓	x
Specification	P, MJ	Base

See notes of Table 3.4. *Stars: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Italian control firms. As an additional robustness check, we swap the donor pool to all Italian firms. Italy is the fourth largest economy in Europe (after Germany, the UK and France) and one of the few European countries that does not yet have a national minimum wage. Wage floors are set by collective agreements between trade unions and employer organizations at the sector level. Though the sectoral minimum wages are relatively high, they formally apply only to members of the signatory parties and non-compliance rates are not negligible (Garnero, 2018). Moreover, the agreed minima did not experience any significant movement in the time period studied. The Italian data was obtained

through AIDA, an oft-used database compiled by Bureau van Dijk. Due to the more demanding accounting requirements in Italy, the database is rather comprehensive, especially with regards to employment numbers and much more so than its German counterpart Dafne. Unfortunately, it does not contain credit ratings, so we are limited to matching on past employment (2011-2013). Table 3.13 shows the results.

Table 3.13: Employment and turnover effects - Italian control firms

	East		West	
	Emp	Turn	Emp	Turn
	(1)	(2)	(3)	(4)
Δ Growth 14-15	-.011	.026	-.004	.028
	(.002)***	(.008)***	(.004)	(.009)***
Δ Growth 14-16	-.004	.071	.012	.08
	(.004)	(.013)***	(.006)*	(.015)***
# of treated	3746	2971	1093	989
# of controls	190754	278078	190754	278078
# of controls used	133637	844	86590	350
SDM 14-16	-.02	.3	.06	.38
SDM 14-15	-.07	.16	-.03	.21
SDM 13-14	0.2	.25	.11	.26
SDM 2013	0	.04	0	.03
SDM 2012	0	.03	0	.03
SDM 2011	0	.03	0	.03
Trend Judgement	✓	x	x	x
Specification	Base	Base	Base	Base

See notes of Table 3.3. Matching on one extra year to compensate for lack of credit ratings. *Stars: * p < 0.1, ** p < 0.05, *** p < 0.01*

As in our main regressions, we see a negative employment effect in the East only (column 1). At -1.1 percentage points in 2015, it is similar in magnitude to the within-Germany comparisons, although the gap closes by 2016 (-0.4 percentage points). Unfortunately, it appears Italian firms are too different from German ones to learn more about the minimum wage effects. The SDM in 2013-14, which we use to check similarity, is

very high in the other regressions, at 0.11 for employment in the West (column 3) and 0.25/0.26 for turnover (East/West, columns 2 and 4).

However, it is reassuring that our evaluation criteria are not always met, which would cast doubt on their usefulness. Moreover, we did not have credit ratings to match on. These are based on forward looking assessments, which might also explain why the estimations where we do match on them lead to more similar firms across the treated and control groups.

3.8 Appendix

Table 3.A1: Overview of bite, gap and wage bill indicators by sector (East-West)

Nace Code	Share West-East	Gap West-East	Wage Bill West-East	Nace Text
55	52 - 64	1.37 - 2.14	12 - 26	Accommodation
56	52 - 64	1.36 - 2.13	12 - 26	Food and beverage service activities
47	29 - 48	0.70 - 1.26	4 - 12	Retail trade, excl. of motor vehicles and motorcycles
69	23 - 45	0.49 - 0.99	2 - 7	Legal and accounting activities
12	23 - 45	0.49 - 0.99	2 - 7	Manufacture of tobacco products
80	23 - 44	0.48 - 0.97	2 - 7	Security and investigation activities
73	23 - 44	0.48 - 0.98	2 - 7	Advertising and market research
78	23 - 44	0.48 - 0.98	2 - 7	Employment activities
74	23 - 43	0.48 - 0.97	2 - 6	Other professional, scientific and technical activities
71	22 - 43	0.47 - 0.96	2 - 6	Architectural and engineering activities; technical testing and analysis
11	28 - 42	0.52 - 0.94	3 - 9	Manufacture of beverages
45	21 - 42	0.53 - 1.20	3 - 12	Wholesale and retail trade and repair of motor vehicles and motorcycles
10	28 - 42	0.52 - 0.95	3 - 9	Manufacture of food products
70	22 - 42	0.47 - 0.95	2 - 6	Activities of head offices; management consultancy activities
82	22 - 42	0.47 - 0.94	2 - 6	Admin, office support and other business support activities
79	16 - 41	0.30 - 0.94	2 - 8	Travel agency, tour operator and related activities
52	16 - 40	0.30 - 0.93	2 - 8	Warehousing and support activities for transportation
77	21 - 40	0.46 - 0.91	2 - 7	Rental and leasing activities
50	16 - 39	0.31 - 0.87	2 - 7	Water transport
15	20 - 39	0.51 - 0.85	3 - 9	Manufacture of leather and related products
66	11 - 38	0.18 - 0.86	0 - 6	Activities auxiliary to financial services and insurance activities
14	20 - 38	0.63 - 0.82	3 - 9	Manufacture of wearing apparel
23	12 - 38	0.30 - 0.62	2 - 5	Manufacture of other non-metallic mineral products
95	22 - 38	0.53 - 0.99	3 - 9	Repair of computers and personal and household goods
13	16 - 38	0.27 - 0.77	2 - 8	Manufacture of textiles
63	21 - 37	0.47 - 0.88	2 - 6	Information service activities
51	3 - 37	0.06 - 0.89	0 - 8	Air transport
31	14 - 34	0.33 - 0.35	2 - 4	Manufacture of furniture
68	14 - 32	0.32 - 0.87	1 - 5	Real estate activities
93	26 - 32	0.73 - 0.93	5 - 8	Sports activities and amusement and recreation activities
19	12 - 29	0.29 - 0.43	2 - 4	Manufacture of coke and refined petroleum products
8	14 - 29	0.32 - 0.61	2 - 5	Other mining and quarrying
61	23 - 29	0.60 - 0.92	2 - 6	Telecommunications
49	21 - 28	0.47 - 0.66	2 - 5	Land transport and transport via pipelines
91	23 - 28	0.67 - 0.84	4 - 6	Libraries, archives, museums and other cultural activities
60	23 - 28	0.67 - 0.85	4 - 6	Programming and broadcasting activities
92	23 - 28	0.67 - 0.85	4 - 6	Gambling and betting activities
59	22 - 28	0.64 - 0.82	3 - 6	Audiovisual productions
90	23 - 28	0.67 - 0.85	4 - 6	Creative, arts and entertainment activities
53	23 - 28	0.61 - 0.93	2 - 6	Postal and courier activities
94	11 - 26	0.20 - 0.58	1 - 3	Activities of membership organisations
18	15 - 26	0.40 - 0.53	1 - 4	Printing and reproduction of recorded media
87	14 - 26	0.27 - 0.49	1 - 3	Residential care activities
75	14 - 26	0.27 - 0.49	1 - 3	Veterinary activities
58	15 - 26	0.40 - 0.54	1 - 4	Publishing activities
88	14 - 26	0.27 - 0.50	1 - 3	Social work activities without accommodation
17	10 - 26	0.27 - 0.48	1 - 4	Manufacture of paper and paper products
86	14 - 26	0.27 - 0.49	1 - 3	Human health activities
42	7 - 23	0.20 - 0.45	1 - 4	Civil engineering
41	8 - 23	0.21 - 0.48	1 - 4	Construction of buildings
16	13 - 23	0.38 - 0.19	2 - 2	Manufacture of wood related products, straw and plaiting, excl. furniture
46	12 - 22	0.21 - 0.21	1 - 2	Wholesale trade, excl. of motor vehicles and motorcycles
30	8 - 22	0.12 - 0.38	0 - 3	Manufacture of other transport equipment
32	8 - 22	0.16 - 0.20	1 - 2	Other manufacturing
22	12 - 22	0.27 - 0.45	1 - 4	Manufacture of rubber and plastic products
43	7 - 22	0.20 - 0.44	1 - 4	Specialised construction activities
29	5 - 22	0.09 - 0.44	0 - 3	Manufacture of motor vehicles, trailers and semi-trailers
6	5 - 21	0.12 - 0.30	1 - 2	Extraction of crude petroleum and natural gas
72	10 - 21	0.29 - 0.42	1 - 3	Scientific research and development
24	3 - 20	0.05 - 0.31	0 - 2	Manufacture of basic metals
25	6 - 20	0.12 - 0.30	1 - 2	Manufacture of fabricated metal products, excl. machinery and equipment
33	7 - 18	0.14 - 0.28	1 - 2	Repair and installation of machinery and equipment
26	6 - 17	0.12 - 0.20	0 - 1	Manufacture of computer, electronic and optical products
27	5 - 16	0.10 - 0.32	0 - 2	Manufacture of electrical equipment
65	7 - 15	0.16 - 0.54	0 - 3	(re-)Insurance and pension funding, excl. compulsory social security
5	4 - 13	0.11 - 0.23	1 - 2	Mining of coal and lignite
62	6 - 13	0.17 - 0.47	1 - 2	Computer programming, consultancy and related activities
9	5 - 12	0.12 - 0.21	0 - 2	Mining support service activities
21	3 - 12	0.06 - 0.21	0 - 1	Manufacture of basic pharmaceutical products and preparations
20	3 - 12	0.05 - 0.21	0 - 1	Manufacture of chemicals and chemical products
36	7 - 11	0.16 - 0.28	1 - 2	Water collection, treatment and supply
28	3 - 10	0.08 - 0.14	0 - 1	Manufacture of machinery and equipment n.e.c.
85	11 - 9	0.26 - 0.24	1 - 1	Education
39	7 - 9	0.15 - 0.17	1 - 1	Remediation activities and other waste management services
35	5 - 8	0.12 - 0.21	0 - 1	Electricity, gas, steam and air conditioning supply
37	6 - 7	0.14 - 0.14	1 - 1	Sewerage
64	3 - 7	0.07 - 0.08	0 - 0	Financial service activities, excl. insurance and pension funding
38	6 - 6	0.13 - 0.12	1 - 1	Waste collection, treatment and disposal activities; materials recovery
84	4 - 5	0.08 - 0.16	0 - 1	Public administration and defence; compulsory social security

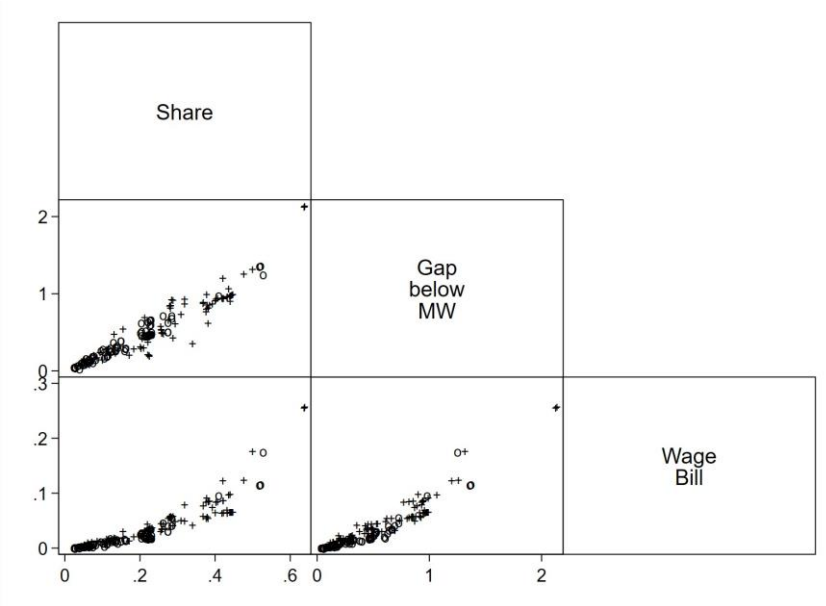
Unlisted sectors are excluded based on legislative reasons or due to pre-existing higher sectoralminimum wage agreements. *Share*: share earning less than 8.50 in 2013-2014 (percentage). *Gap*: gap between hourly wage in 2013-2014 and MW for those earning less than the MW. *Wage Bill* : relative increase in total wage bill under full compliance and no spillovers (percentage).

Table 3.A2: Summary statistics

	Control	Treated	Rel. Diff.
	Size Shares		
Micro (1-9)	42	50	+ 0.19
Small (10-49)	42	37	- 0.12
Medium (50-249)	13	11	- 0.15
Large (250+)	3	2	- 0.33
	Age Shares		
Start-ups (1-5)	8	11	+ 0.38
Young (6-10)	13	16	+ 0.23
Mature (11+)	78	73	- 0.06
	Dependent Variable Means (SD)		
Δ log(employment) (1415)	.019 (.29)	.026 (.35)	+ 0.37
Δ log(employment) (1416)	.035 (.4)	.049 (.46)	+ 0.40
Δ log(turnover) (1415)	.01 (.33)	.008 (.35)	- 0.20
Δ log(turnover) (1416)	.038 (.43)	.042 (.47)	+ 0.11
Δ credit rating (1415)	.198 (22.54)	-.652 (23.16)	- 4.29
Δ credit rating (1416)	1.266 (34.38)	-1.245 (32.11)	- 1.98
	Lagged Variable Means (SD)		
log(employment) (2012)	2.49 (1.46)	2.209 (1.4)	- 0.11
log(employment) (2013)	2.529 (1.46)	2.24 (1.4)	- 0.11
log(employment) (2014)	2.547 (1.46)	2.262 (1.4)	- 0.11
log(turnover) (2012)	14.299 (1.71)	13.996 (1.55)	- 0.02
log(turnover) (2013)	14.338 (1.7)	14.04 (1.54)	- 0.02
log(turnover) (2014)	14.44 (1.68)	14.148 (1.52)	- 0.02
credit rating (2012)	240.365 (43.76)	241.307 (43.5)	0
credit rating (2013)	238.876 (43.88)	239.343 (43.47)	0
credit rating (2014)	238.517 (44.51)	238.728 (43.62)	0
	Context Variables (SD)		
log(productivity) (2014)	11.779 (.70)	11.8 (.87)	0
state unemployment rate	6.422 (2.45)	8.731 (1.99)	+ 0.36
state share mini-jobs	.13 (.06)	.251 (.16)	+ 0.93
N	53 489	10 257	- 0.80

Rel. Diff.: the relative difference between treated and control group is defined as RD = (T - C)/C. N, size and age shares are based on all observations used in any of the regressions. The number of observations used to calculate the variable means (SDs) may differ based on missings in that particular variable.

Figure 3.A.1: Correlation share, gap and wage bill indicators



See notes below Table 3.A1 for a description of the indicators. +: values for sectors in the East, o: the West.

Table 3.A3: Difference in difference, by region

	East			West		
	ΔEmp	ΔTurn	ΔCR	ΔEmp	ΔTurn	ΔCR
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.00615	0.00652	0.160	-0.0115 **	0.0116*	0.346
	(0.79)	(0.63)	(0.41)	(-2.53)	(1.93)	(0.80)
N	270030	194146	321172	-	-	-
# of treated	40176	28918	49672	-	-	-
# of controls	229854	165228	271500	-	-	-
Treated × 2010	-0.0250	0	-1.013	0	0	0
	(-1.02)	(.)	(-0.73)	(.)	(.)	(.)
Treated × 2011	0	-0.0168	0	0.00902	-0.0447*	-0.795
	(.)	(-0.37)	(.)	(0.35)	(-1.80)	(-0.63)
Treated × 2012	-0.0134	-0.0180	1.763	-0.0146	-0.00496	-1.802**
	(-0.67)	(-0.58)	(1.32)	(-0.57)	(-0.22)	(-2.08)
Treated × 2013	-0.00596	0.0208	0.691	-0.0562***	-0.00526	-1.520*
	(-0.42)	(0.95)	(0.65)	(-2.69)	(-0.25)	(-1.83)
Treated × 2014	0.00118	0.0259	0.975	-0.0477**	-0.0114	-0.352
	(-2.24)	(-0.52)	(-0.40)	(0.08)	(1.08)	(0.96)

Regressions include firm fixed effects and (East Germany * Year) fixed effects. Standard errors are clustered at the labour market region. Estimates come from regressions with an interaction term for East Germany; this is stressed by only showing one set of N statistics per dependent variable. Dependent variable was in differences. Employment and turnover variables are in logs. *Stars: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Chapter 4

Is protection really good for the imposing country? A production network approach

4.1 Introduction

Since the global financial crisis, the call for policies aimed at protecting domestic production has been on the rise in many Western countries. This trend is particularly evident in the US where the Trump administration has embraced an "America First" approach to economic policy. After the initial decision to withdraw from the Trans Pacific Partnership (TPP) and to renegotiate the North American Free Trade Agreement (NAFTA), the US government levied a series of substantial import tariffs: in January 2018 it ordered tariffs on imported washing machines and solar panels[54], in march 2018 it turned to steel (25 percent)

[54] The duty on washing machines contains a quota-like element where imports above a certain threshold have a higher tariff: in the first year, imported washing machines will be subject to a 20 percent tariff for the first 1.2 million imported machines, and a 50 percent tariff on subsequent machines; these rates will drop, respectively, to 16 percent and 40 percent over a three-year period. The tariff on imported solar panels is an additional duty with an exclusion threshold only for imported cells: in the first year, imported solar panels

and aluminium (10 percent), and now it is thinking of cars. In light of these developments, our goal is to provide further understanding on the macroeconomic consequences of import tariffs applied to intermediate inputs in the context of a model of production networks à la Acemoglu et al. (2012, 2016) that allows us to account for the existence of inter-industry input-output linkages. Such a framework also lends itself to the assessment of a highly controversial fiscal policy proposal put forward by the Republican Party (GOP), involving the move from the current origin-based corporate tax system to a destination-based one.

We start with the analysis of import tariffs. Standard trade theory asserts that a country with monopoly power benefits from imposing unilaterally a modest import duty (see Humphrey, 1987). The underlying argument is that, by taxing imports, the large country shifts domestic demand away from foreign produced products and towards domestically produced products, improving so its terms-of-trade (the relative price of imports in terms of exports). Optimum tariff theory has been extended in various ways (e.g. Scitovsky, 1942; Johnson, 1953; Kennan and Riezman, 1988; Kemp, 1966; Jones, 1967; Gehrels, 1971; see Pomfret, 1992), and, in addition to market power, the literature has put forward a number of other potential rationales for protectionism – such as the role of politics (e.g. Mayer, 1984; Magee et al., 1989; Grossman and Helpman, 1994). Yet, echoing the theory of effective protection, a recent body of work, pioneered by Yi (2003), has recognized that, in order to assess the net impact of import tariffs in today's increasingly vertically-interconnected economies, it is crucial to account for trade in intermediate goods and to distinguish between output tariffs - applied in the final market - and input tariffs - applied in the intermediate markets. Indeed, trade in intermediate goods now amounts to as much as two-thirds of international trade (Johnson and Noguera, 2012) and the presence of interconnections among sectors in the form of input-output linkages suggests that tariffs have a more complex and articulated impact on the aggregate economy than postulated by standard theory. We develop here a simple input-output model to characterize how an idiosyncratic input tariff shock affects the imposing country.

will be subject to a 30 percent tariff; this rate will gradually fall to 15 percent over a four-year period.

Our theoretical framework features a large open economy[55,56], populated by a representative household and by n perfectly competitive sectors each specializing in a distinct good. On the consumption side, the representative household gets disutility from providing labour to firms at a sector-homogenous wage rate and derives utility from an aggregate final good, which is a Cobb-Douglas combination of n domestic end products. On the production side, every sector produces its output with a constant-returns-to-scale Cobb-Douglas technology that combines labour with an intermediate input bundle; the latter is a Cobb-Douglas combination of n intermediate goods, each of which is, in turn, a CES aggregate over a domestic and foreign variety[57]. Within any industry, prices of the two varieties may differ by a given proportionality constant. Moreover, imported inputs are subject to sector-specific ad-valorem tariffs, which are absorbed in a fixed part by foreign producers. For simplicity, we assume that tax revenues are wasted.

Our characterization result establishes that a tariff increase on a given imported intermediate good entails an overall loss of GDP that reflects not only the direct effect on the immediate customers of the protected industry, but also the indirect effects on its customers' customers and so on. Indeed, being forced to substitute away from the foreign to the corresponding domestic variety, national firms that source inputs from the affected industry experience a drop in productivity, which translates into lower output and higher prices (relative to the wage), and so triggers a downstream propagation of the shock over input-output linkages.[58] The extent to which GDP contracts depends on four specific characteristics of the tariff-exposed industry: the importance as (direct and indirect) input supplier, the elasticity of substitution between the domestic and foreign intermediate input variety, the pre-tax differential in their price, and the tariff pass-through into import price.

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[55] A country is said to be "large" if it can exert an influence on world prices.

[56] Nicita et al. (2018) show that the economies facing the lowest export supply elasticities and therefore having the strongest market power are the US and the European Union.

[57] The nested Cobb-Douglas-CES structure of the sector-specific production technology is in line with the trade literature relying on the Armington assumption (see, for example, Vandenbussche et al., 2017, 2018).

[58] As in Carvahlo and Tahbaz-Salehi (2018), by downstream propagation we mean that the shock transmits from one industry to another in the direction of the flow of goods.

After studying import tariffs, we turn to the corporate tax reform proposal currently under debate in the US. Based on the work by Auerbach and Devereux (2013) and Auerbach et al. (2017), its advocates call for the introduction of a so-called border-adjustment tax that, in the computation of a company's taxable profit, would include the cost of imported inputs but exclude the revenue accrued from exports. Such a policy is argued to be neutral, that is to have no effect on real allocations. Yet, this neutrality result relies on assumptions – first and foremost the trade balance condition - that are unlikely to hold in practice (Barbiero et al., 2018) and are in contradiction with the rationale underpinning the US policy proposal.

We re-assess the aggregate effects of a shift to border-adjusted business income taxation, by adding exports to our model - taken, for simplicity, to be a given share of each industry's output - and by replacing sector-specific import tariffs with a uniform profit tax imposed on all firms in the economy. Our theoretical predictions indicate that the GDP impact of the fiscal regime change results from two opposing effects: while the impossibility to deduct the costs associated with imported intermediate goods produces an outcome akin to import tariffs, the ability to deduct export sales drives aggregate output up by ensuing a cascade of positive downstream production adjustments. For low sectoral export shares, the former effect dominates over the latter.

Related Literature. The present chapter is most closely related to Acemoglu et al. (2012) and Acemoglu et al. (2016), who stressed the role of the input-output structure in determining whether and how idiosyncratic sectoral shocks can propagate throughout the economy and shape aggregate outcomes. Their setup, which builds on the seminal paper by Long and Plosser (1983), has been extended in a number of ways[59] – for example, by allowing for more general production technologies (e.g. Carvalho et al., 2016, Baqaee and Fahri, 2018a), by departing from the assumption of perfect competition (e.g. Grassi, 2017; Baqaee and Fahri, 2018b; Liu, 2018) and by accommodating endogenous

[59] See Carvahlo and Tahbaz-Salehi (2018) for a review of the theoretical and empirical literature on production networks in macroeconomics.

changes in the production network (e.g. Carvalho and Voigtlander, 2015; Oberfield, 2018; Acemoglu et Azar, 2018). Yet, so far, research has focused mainly on a closed-economy setting[60]. We propose an open economy extension of the production network model presented in Acemoglu et al. (2012, 2016) by allowing for gross substitution between a domestic and an imported variety of each intermediate input and by postulating that a fixed share of each industry's output is sold abroad.

The analysis of input tariffs is also related to two distinct strands of the trade literature. A recent body of work has embedded a multi-sector environment featuring production linkages into quantitative trade models and evaluates the welfare implications of trade shocks (e.g. Costinot and Rodríguez-Clare, 2014; Caliendo and Parro, 2015; Ossa, 2015; Blaum, 2016; Caliendo et al., 2017). Except for a few studies concerned with the consequences of UK's withdrawal from the European Union (e.g. Dhingra et al., 2017; Felbermayr et al. 2018), these contributions have mainly looked at tariff reductions and have shown that the welfare gains from trade liberalization are larger in the presence of input trade and sectoral interrelations[61]. In light of current protectionist tendencies, we use, instead, our simple input-output setting to assess the value-added consequences of import tariff hikes targeted at intermediate products.

Another line of research in the trade literature evaluates tariff shocks within trade network models that account for worldwide sector-level input-output linkages in production (e.g. Noguera, 2012; Blanchard et al., 2016; Vandenbussche et al., 2017, 2018).[62] This approach allows to determine how trade barriers levied in one country affect its trading partners when indirect exports are taken into account. Yet, as we are interested in assessing the desirability of a higher input tariff for the imposing country even aside from the risk of retaliation, we focus on the domestic production network.

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[60] There are only few exceptions (e.g. Acemoglu et al., 2016; Caliendo et al. 2018b).

[61] A variety of firm-based models of imports with input-output linkages draw similar conclusions with respect to firm performance (e.g. Goldberg et al., 2010; Gopinath and Neiman, 2014; Halpern et al., 2015).

[62] See Chaney (2016), Johnson (2018) and Bernard and Moxnes (2018) for a general overview of network models in trade.

Finally, the evaluation of the GOP's fiscal policy proposal is related to the macroeconomic literature exploring the real allocative impact of border adjustment taxes, either in their explicit form - a combination of an import tariff and an export subsidy - or in their implicit form - as part of value added taxation or corporate profit taxation. This literature has proceeded along two principal avenues. On the one hand, it has outlined the conditions that must be satisfied in order for a border adjustment tax to be neutral in the short-run and/or in the long-run (Grossman, 1980; Feldstein and Krugman, 1990; Auerbach and Holtz-Eakin, 2016; Lindè and Pescatori, 2017; Barbiero et al., 2018). On the other hand, it has shown how such a policy can be used as a tool to stimulate the economy just in the same ways as exchange rate devaluations (Keynes, 1931; Farhi et al., 2014; Erceg et al., 2017). We contribute to this literature by providing a characterization of the propagation of the fiscal shock throughout the economy. To parallel the recent US reform proposal, we nest the border adjustments into business income taxation.

Outline. The remainder of this chapter is organized as follows. In section 4.2, we lay out the theoretical framework that allows us to characterize how idiosyncratic input tariff shocks affect a highly vertically-integrated economy. Section 4.3 adapts this model to the analysis of border-adjustments nested into corporate profit taxation. Conclusions are drawn in Section 4.4 and proofs are provided in Section 4.5.

4.2 Tariffs on imported intermediates

In this Section, we generalize the static multi-sector network model of Acemoglu et al. (2012, 2016), by allowing also for imports of intermediate goods from abroad. This framework provides us with theoretical predictions on the macroeconomic consequences of a sector-specific input tariff change when the role of input-output linkages is accounted for.

4.2.1 Model setup

Consider a static large open economy with n perfectly competitive sectors, denoted by $\{1, \dots, n\}$. Each sector specializes in the production of a distinct good whose output sales (net of national imports of the same good) meet final demand by households and intermediate input demand by other sectors.

The final demand side is summarized by a single representative household who provides l units of labour at a wage w and has Cobb-Douglas preferences over domestic final goods from all n sectors:

$$U(c_1, \dots, c_n, l) = \gamma(l) \prod_{i=1}^{n} {c_i}^{\beta_i} \tag{4.1}$$

where c_i is the consumption of the final good produced at home by sector i, $0 < \beta_i < 1$ designates the weight of commodity i in the utility of the representative household and $\gamma(\cdot)$ is a decreasing differentiable function capturing the disutility from work.[63] Throughout, we assume that $\sum_{i=1}^{n} \beta_i = 1$. Total labour supply is split between industries so as to satisfy $l = \sum_{i=1}^{n} l_i$.[64]

Output of every sector within the domestic economy is obtained according to a Cobb-Douglas technology that combines labour with a composite intermediate good:

$$y_i = l_i^{\alpha_i} \prod_{j=1}^{n} m_{ij}^{a_{ij}} \tag{4.2}$$

where y_i is the total output of sector i, l_i is the amount of labour hired by sector i and m_{ij} is the amount of commodity j used in the production of good i. The coefficients $\alpha_i > 0$ and $a_{ij} \geq 0$ designate, respectively, the

[63] In Section 4.5.4, we show that our main results are qualitatively unaffected when we allow for gross substitution between a domestic and a foreign variety of each final good.

[64] Traditional trade models typically say that protectionism doesn't cost (or add) jobs, rather changes the employment mix (Krugman, 2018). In reality, there might be labour adjustment costs to trade shocks (Artuç et al., 2010), as suggested also by the results in Chapter 2; although important, the latter are not crucial for assessing the basic mechanism by which input tariffs exert their aggregate impact.

elasticity of industry i's output with respect to labour and intermediate good j. A larger a_{ij} means that the output of industry i is more responsive to a change in the level used of intermediate input j, whereas $a_{ij} = 0$ if intermediate good j is not needed in the production of industry i (our a_{ij} is equivalent to w_{ij} in Acemoglu et al., 2012). Throughout, we assume that $\alpha_i + \sum_{j=1}^{n} a_{ij} = 1$ for all i. This normalization guarantees that the sectoral production functions exhibit constant returns to scale.

The intermediate good demand m_{ij} is, in turn, a CES aggregate of a quantity x_{ij} purchased from domestic producers and a quantity $\bar{x}_{ij}$ purchased from foreign producers:

$$m_{ij} = \left[x_{ij}^{\frac{\sigma_j - 1}{\sigma_j}} + \bar{x}_{ij}^{\frac{\sigma_j - 1}{\sigma_j}} \right]^{\frac{\sigma_j}{\sigma_j - 1}} \tag{4.3}$$

where $\sigma_j > 1$ is the elasticity of substitution between the domestic and foreign variety of the intermediate good produced within sector j.

The government levies a sector-specific ad-valorem duty on intermediate products imported from abroad. The overall tax revenue raised by granting protection to inland industries amounts to:

$$T = \sum_{i=1}^{n} \sum_{j=1}^{n} \varepsilon_i t_i \bar{p}_i \bar{x}_{ji} \tag{4.4}$$

where $\bar{p}_i$ is the pre-tax price paid for foreign intermediate input i, $t_i \in [0,1]$ is the tariff rate imposed on the value of the same good and $0 < \varepsilon_i < 1$ is the part of this tariff actually borne by domestic producers. For simplicity, we assume that T is entirely wasted and that $\bar{p}_i$ is proportional to the price p_i paid for home-produced commodity i – i.e. $\bar{p}_i = \mu_i p_i$ with μ_i being a non-negative constant.

Then, the market clearing condition for each national industry i can be written (in nominal terms) as:

$$p_i y_i - \sum_{j=1}^{n} \bar{p}_i (1 + \varepsilon_i t_i) \bar{x}_{ji} = p_i c_i + \sum_{j=1}^{n} p_i x_{ji}. \tag{4.5}$$

4.2.2 Competitive equilibrium

In line with Acemoglu et al. (2012, 2016), we focus on the notion of competitive equilibrium for the static large open economy outlined above. A competitive equilibrium is here defined as a collection of prices $(\{p_i\}_{i=1}^n, \{\bar{p}_i\}_{i=1}^n, w)$ and quantities $\left\{c_i, y_i, l_i, \{x_{ij}\}_{j=1}^n, \{\bar{x}_{ij}\}_{j=1}^n\right\}_{i=1}^n$ such that:

i. given prices, the representative household chooses consumption of each final good and total labour supply so as to maximize his utility (equation 4.1) subject to his budget constraint

$$C = \sum_{i=1}^{n} p_i c_i = wl; \tag{4.6}$$

ii. given prices, the representative firm in any sector i chooses the amount of labour and of the domestic and foreign variety of each intermediate good in order to maximize its net profits

$$\pi_i = p_i y_i - w_i l_i - \sum_{j=1}^{n} p_j x_{ij} - \sum_{j=1}^{n} \bar{p}_j (1 + \varepsilon_j t_j) \bar{x}_{ij} \tag{4.7}$$

subject to its production possibility (equation 4.2) and the zero-profit condition;

iii. the labour market and all commodity markets clear.

In Section 4.5.1 we fully characterize the unique competitive equilibrium solution to the basic model. Since income and substitution effects cancel out in the presence of Cobb-Douglas preferences, optimal labour supply is independent of the wage rate and the representative household spends a constant fraction of its total budget on the products of each industry:

$$l = -\frac{\gamma(l)}{\gamma'(l)} \tag{4.8}$$

$$\frac{p_i c_i}{wl} = \beta_i \tag{4.9}$$

On the other hand, the fact that profits are zero in perfectly competitive markets with constant-returns-to-scale nested Cobb-Douglas-CES

technologies implies that the costs incurred by any industry for labour and for each intermediate good are constant fractions of its total costs (or, equivalently, its total sales). Specifically, the relative cost of each input in the total costs of a given industry is equal to the sector-specific output elasticity of the corresponding input:

$$\alpha_i = \frac{wl_i}{p_i y_i} \tag{4.10}$$

$$a_{ij} = \frac{p_j x_{ij} + \bar{p}_j(1 + \varepsilon_j t_j)\bar{x}_{ij}}{p_i y_i} \tag{4.11}$$

This property allows us to interpret the output elasticities of inputs as the entries of input-output tables and to represent the structure of input-output interconnections in the economy by a directed weighted network whose nodes correspond to the n industries and whose edges denote an input-supplying relationship with weight a_{ij} between any two sectors.

Summing up equation 4.10 for all industries and using the labour market clearing condition, the wage bill can be obtained as the sum of the labour fractions of the total sales over all industries:

$$wl = \sum_{i=1}^{n} \alpha_i \, p_i y_i = VA. \tag{4.12}$$

Note that, in view of equation 4.11 and the property of constant returns to scale in sectoral production, the sum on the right-hand-side is nothing but the difference between aggregate sales and aggregate spending for intermediate goods. Thus, the wage bill is equivalent to the total value added in the economy.

Moreover, if we combine the market clearing condition for each industry i with the optimal demand of domestic and imported intermediate good i by every sector j and bear in mind the assumptions on the technical coefficients – $a_{ij} \geq 0$ for all i, j and $\sum_{j=1}^{n} a_{ij} < 1$ for all j –, the vector of sectoral sales can be computed as:

$$\begin{pmatrix} p_1 y_1 \\ \vdots \\ p_n y_n \end{pmatrix} = [I - A']^{-1} \begin{pmatrix} p_1 c_1 \\ \vdots \\ p_n c_n \end{pmatrix} = [I + A' + (A')^2 + \cdots] \begin{pmatrix} p_1 c_1 \\ \vdots \\ p_n c_n \end{pmatrix} \tag{4.13}$$

where A is the nxn matrix with entries a_{ij}. Thus, total sales of any industry i are a weighted sum of the (nominal) final demand in each sector, where the weights are given by the non-negative elements in the ith row of the inverse matrix $[I - A']^{-1}$ and reflect the importance of inland industry i as a direct and indirect input supplier to all other industries in the national economy.

4.2.3 Shock propagation

Our goal is to assess how changes in sectoral tariffs targeted at imported intermediates affect the aggregate value added (or GDP) of the imposing country. Recall that, since profits are zero in the competitive equilibrium and the wage rate is homogenous across industries, all the surplus in the economy goes to the consumer and, specifically, total value added in the economy is equal to the wage bill wl. In Section 4.5.2 we establish that, under average price normalization, the logarithm of wl is given by:

$$logw + logl = v' \cdot A \begin{pmatrix} (\sigma_1 - 1)^{-1} log\left[1 + \left(\mu_1(1 + \varepsilon_1 t_1)\right)^{1-\sigma_1}\right] \\ \vdots \\ (\sigma_n - 1)^{-1} log\left[1 + \left(\mu_n(1 + \varepsilon_n t_n)\right)^{1-\sigma_n}\right] \end{pmatrix} \quad (4.14)$$

$$with \quad \frac{1}{n}\mathbf{1}' logp = -logl - v'H$$

where H is a $nx1$ vector with elements $H_i = \alpha_i log\alpha_i + \sum_{j=1}^{n} a_{ij}\, log a_{ij}$ and v' is the transpose of the so-called influence vector defined as:

$$v = \frac{1}{n}[I - A']^{-1}\mathbf{1} = \frac{1}{n}[I + (A') + (A')^2 + \cdots]\mathbf{1}. \quad (4.15)$$

Thus, positive sector-specific input tariff shocks result in an overall loss of GDP that is the outcome of both direct effects and indirect effects transmitted through the production network.

To better grasp the underlying mechanism, imagine that an input tariff increase hits only one sector in the economy, say sector i. Such a trade shock makes imported intermediate good i more expensive for its customers and forces them to substitute away from it to the

corresponding domestic variety. Against a drop in productivity, industry i's customers will scale back their production. This output contraction, in turn, increases the price (relative to w) faced by the customers of industry i's customers and induces a second round of adjustments as the latter will also react by reducing production. Thus, a cascade effect is underway: the original shock to industry i percolates through the production network by lowering the output not only of industry i's customers, but also of its customers' customers, and so on.

The size of the resulting GDP loss depends on the interaction of four factors relating to the affected industry: [65]

a. network centrality: if industry i has only few linkages with other peripheral sectors, then even a large shock may not affect much aggregate GDP; vice versa, if the same industry is an input-supplier to many other central sectors in the economy, then just a small shock may induce significant GDP losses;

b. elasticity of substitution between the domestic and imported intermediate good variety: for $\mu_i(1+\varepsilon_i t_i) < 1$, the higher is the elasticity of substitution between the domestic and foreign variety of intermediate good i, the larger will be the decline in the economy's total value added;

c. ratio of the pre-tax foreign over home price: the stronger is the initial absolute price disadvantage of the domestic economy for intermediate good i, the greater will be the fall in aggregate national output;

d. pass-through from the tariff rate into the import price: for $\left(\mu_i(1+\varepsilon_i t_i)\right)^{\sigma_i - 1}[(\sigma_i - 1)\varepsilon_i t_i - 1] < 1$ (always satisfied when t_i is not too large), the larger is the part of the tariff that falls on national customers of imported intermediate good i, the more pronounced the contraction of GDP will be.

In Section 4.5.2, we also investigate the effect of sector-specific input tariff shocks on other endogenous variables. Specifically, we show that

[65] Note that the comparative statics results for the parameters μ_i, ε_i, σ_i must be viewed in combination one with each other.

the effect on final consumption levels is exactly opposite to the effect on the corresponding domestic relative price:

$$dlogc = -d(logp - \mathbf{1}logw) \tag{4.16}$$

Moreover, we also show that, if preferences are symmetric as in Acemoglu et al. (2012), the effect on the output of any good mirrors the effect on the quantities consumed of this good as a final commodity:

$$dlogy = dlogc, \tag{4.17}$$

Thus, under Cobb-Douglas preferences and technologies, there is no impact on the protected industry itself and its (direct and indirect) suppliers as upstream propagation results from two distinct effects – a *price* effect and a *quantity* effect - that exactly offset each other.

Our theoretical predictions hinge strongly on two crucial features of the underlying model. First, we consider only the short-term effects of an idiosyncratic tariff hike imposed unilaterally on imported intermediates. This perspective ignores beggar-thy-neighbour policies, but can be justified on the ground that we aim to re-assess the optimality of import tariffs for the imposing country even before the risk of retaliation (see also Krugman, 2018). Our results suggest that, when all direct and indirect effects of a higher duty on goods used as input by other sectors are accounted for, the adoption of such a policy may prove counterproductive.

Second, for computational convenience, we posit that production in every industry is described by a nested Cobb-Douglas-CES technology and we conceive import taxation as purely distortionary. These approximations do not allow to capture potential network effects due to changes in the composition of production factors used by firms and to the redistribution of the tax proceeds raised by the government. In any case, while tariff revenues may result in unproductive public spending (as exemplified by the massive boost to defence spending envisioned in Trump's 2019 budget plan), Carvalho et al. (2017) show that the "labour substitution effect" is always weaker than the "output effect" [66].

[66] Baqaee and Fahri (2018a) extend this result to a general class of economies with heterogeneous agents, arbitrary nested CES technologies and multiple production factors.

4.3 Border-adjustments in corporate profit taxation

The simplified theoretical setting outlined in the previous section can also be used to examine the macroeconomic consequences of an alternative policy measure, which is currently under debate in the US and features a more comprehensive state action. Concerned with the fact that the US corporate tax system is biased against domestic production[67], the Republican Party released in 2016 a radical corporate tax reform proposal. A key feature of their plan is the so-called border adjustment tax (BAT) that would make export sales deductible from the corporate tax base, while expenditure on imported inputs would not be deductible - in contrast with other costs such as wage bill and purchases of domestic intermediates.

If we set $t_i = 0$ for every i and denote by τ the corporate profit tax rate uniform across all sectors, the analysis of the implications associated with the adoption of BAT requires only to introduce trade outflows into our model. For simplicity, we model exports from any industry i as a given share $1 - \vartheta_i$ of its total output, with ϑ_i close to 1. Then, net profits of representative firm i can be written as:

$$\pi_i = (1-\tau)\left(p_i\vartheta_i y_i - wl_i - \sum_{j=1}^{n} p_j x_{ij}\right) + \\ + (1-\varphi\tau)\left((1-\vartheta_i)p_i y_i - \sum_{j=1}^{n} \bar{p}_j \bar{x}_{ij}\right) \qquad (4.18)$$

where $\varphi = 1$ under the current origin-based regime and $\varphi = 0$ under the newly proposed destination-based regime.

[67] The US system subjects resident companies to corporate taxation based on their worldwide income, though allowing to defer the tax payment on profits earned abroad until they are remitted to the US. Such a system generates two potential distortions: it encourages US corporations either to strand profits abroad (*lock-out effect*) or to merge with a small corporation in a low-tax country (*corporate inversion*).

In Section 4.5.3 we show that, using the same price normalization as above, the change in the logarithm of the wage bill induced by a shift to border-adjusted corporate profit taxation is:

$$logwl(\varphi = 0) - logwl(\varphi = 1) =$$

$$= \underbrace{v' \cdot \begin{pmatrix} log\dfrac{1-\tau\vartheta_1}{1-\tau} \\ \vdots \\ log\dfrac{1-\tau\vartheta_n}{1-\tau} \end{pmatrix}}_{export\ subsidy} + \underbrace{v' \cdot A \begin{pmatrix} (\sigma_1-1)^{-1} log\dfrac{(1-\tau)^{\sigma_1-1}+\mu_1^{\sigma_1-1}}{1+\mu_1^{\sigma_1-1}} \\ \vdots \\ (\sigma_n-1)^{-1} log\dfrac{(1-\tau)^{\sigma_n-1}+\mu_n^{\sigma_n-1}}{1+\mu_n^{\sigma_n-1}} \end{pmatrix}}_{import\ tax} \quad (4.19)$$

In other words, the GDP response to the fiscal reform proposal results from the combined effect of BAT's two key components:

- an implicit import tax. By not allowing to deduct costs for imported intermediate goods, BAT forces importing industries to substitute away from these goods to the corresponding domestic ones. Against a drop in productivity, importing industries will then scale down their production. This output contraction, in turn, increases the (relative) price faced by the customers of the importing industries and induces a second round of adjustments as the latter will also react by lowering output, and so on.
- an implicit export subsidy. By allowing to deduct export sales, BAT makes national goods more attractive on the world market. Exporting industries will then have an incentive to scale up their production. This output expansion, in turn, lowers the (relative) price faced by the customers of the exporting industries and induces a second round of adjustments as the latter will also react by rising output, and so on.

Note that, when firms in all industries sell their output entirely on the internal market - i.e. $\vartheta_i = 1$ for every i -, the first term in equation 4.19 is zero and the difference in the logarithm of value added under the two corporate tax regimes takes on a negative sign. Thus, by continuity, that difference remains negative also for low sectoral export shares – i.e. ϑ_i

close to 1 for every i[68]: the network propagation triggered by the implicit export subsidy is weaker than the network propagation triggered by the implicit import tax.

This conclusion clearly depends on the simplified open-economy setting considered here. Yet, equation 4.19 still seems to suggest that the adoption of border adjustments as part of business income taxation may be costly in terms of GDP for countries with large trade deficits in sectors that take a central position within the production network. Hence, our analysis provides new food for thought in the debate about the desirability of the fiscal policy in question – beyond the role of currency adjustments (Fahri et al., 2017).

4.4 Conclusion

In recent years, support for free trade has weakened within developed countries and parties calling for state regulation of international trade have gained ground across Western democracies. The most striking example is that of the US, where the Trump administration has already imposed several rounds of tariffs in 2018 based on the claim of unfair competition from its trading partners. But do protective import duties really boost domestic production? To address this issue, the present paper develops a production network model in the spirit of Acemoglu et al. (2012, 2016) that features also imports of intermediate products from abroad. Such a theoretical framework allows to explicitly account for indirect effects due to interconnections among sectors in the form of input-output linkages.

Our model suggests that a sector-specific input tariff increase leads to a contraction in aggregate value added. Indeed, immediate customers of the protected industry, faced with a higher price for the imported intermediate input variety, experience a fall in productivity and scale

[68] Any logarithmic function is continuous over $\mathbb{R}^+$ and the difference of two continuous functions is, in turn, a continuous function.

back their production; the consequent rise in the price (relative to the wage) of these sectors' output creates an indirect negative effect on their own customers, and so on. There is, instead, no upstream propagation to the protected industry and its direct and indirect input suppliers as, with Cobb-Douglas technologies and preferences, price and quantity effects exactly cancel out. Thus, contrary to optimum tariff theory concerned only with final goods, we find that a (higher) protective duty imposed on goods used as inputs by other sectors does not necessarily work to the advantage of the imposing country, even before a trade war kicks off. As most of Trump's tariffs are levied on intermediates, this result has important policy implications.

Another policy currently under discussion in the US with the stated goal to foster domestic economic activity involves the introduction of border-adjustments as part of corporate profit taxation. According to this proposal, the cost of imported inputs would no longer be deductible from the corporate tax base, while export sales could be excluded. In other words, tax jurisdiction would follow the location of consumption rather than the residence of the business or the source of its profits. By modelling exports from each industry simply as a constant share of its total output, we show that the change in GDP from a shift to border-adjusted corporate profit taxation is determined by the combined effect of the implicit import tax and the implicit export subsidy: as a result of a powerful downstream propagation (of opposite sign), the former causes aggregate output to shrink, while the latter leads to its growth. For low sectoral export shares, the contractionary effect of the implicit import tax outweighs the expansionary effect of the implicit export subsidy.

As already pointed out throughout, several important issues remain open to future research. First, we consider the formally simpler case where tax payments are a pure outflow of resources. An interesting exercise would be to reassess the macro-consequences of a sectoral input tariff hike (or a corporate-tax-based border adjustment) in the presence of productive public expenditure. Indeed, the latter may reshape propagation patterns over input-output linkages and so alter their aggregate implications.

Second, the production process at each node is here approximated by a nested Cobb-Douglas-CES production technology with constant returns to scale. One of the consequences of this assumption is that an industry's expenditure on different inputs as a fraction of its sales is invariant to the realization of the shocks. If we were to impose more general production technologies, allowing for changes in the composition of production factors employed by firms, a higher tariff applied to a given imported intermediate good (or a shift to border-adjusted business income taxation) would impact aggregate output also via a labour substitution channel.

Third, for tractability, our theoretical framework treats exports from any industry as a constant fraction of its output, considers the pass-through from a sector-specific input tariff onto the corresponding import price to be exogenous and postulates that the pre-tax price paid for each imported good is proportional to the price paid for the corresponding domestic good. These conditions do clearly not hold in practice. A more realistic large open economy representation would require to model also foreign consumer preferences as well as overseas production processes.

Fourth, the present analysis ignores the response by other countries to the unilateral imposition of sectoral import tariffs. Yet, most recently the reaction to Trump's tariffs suggests that trading partners are likely to implement retaliatory measures. As industries of highly industrialized economies are now embedded in a web of international transactions, a trade war would probably amplify the GDP loss we detect and, hence, our prediction may be interpreted as a lower bound on the true aggregate effect of sector-specific input tariffs.

Finally, our open economy model features a world of only two countries - Home and Foreign. The extension to a multi-country setting would allow to assess also the impact of a country-specific sectoral input tariff shock (inter alia, the Trump administration set a 25 percent import duty on nearly 6,000 products imported from China). Differential tariff treatment across countries may give rise to trade diversion practices.

4.5 Proofs

4.5.1 Proofs of results in Section 4.2.2

Households. Taking prices and the wage rate as given, the representative household chooses how much to buy of each final good and how much labour to supply so as to maximize its utility subject to the budget constraint:

$$\max_{c_i,l} U(c,l) = \gamma(l)\prod_{i=1}^{n}(c_i)^{\beta_i} \quad subject\ to \quad C = \sum_{i=1}^{n} p_i\, c_i = wl$$

The Lagrangian function for this problem can be written as:

$$\mathcal{L} = \gamma(l)\prod_{i=1}^{n}(c_i)^{\beta_i} + \lambda\left(wl - \sum_{i=1}^{n} p_i\, c_i\right).$$

Differentiating this function with respect to c_i and l, yields the following set of first-order conditions:

$$\frac{\gamma'(l)U(c,l)}{\gamma(l)} + \lambda w = 0$$
$$\beta_i\,(c_i)^{-1}U(c,l) - \lambda p_i = 0.$$

From these conditions, it follows that:

$$p_i c_i = -\frac{\gamma(l)}{\gamma'(l)}\beta_i w.$$

Substituting the expression for $p_i c_i$ into the budget constraint of the representative household, we obtain:

$$l = -\frac{\gamma(l)}{\gamma'(l)}.$$

The optimal labour supply does not depend on the wage rate w and is

completely determined by the household's disutility from work. As a consequence, consumption spending on each final good is (positively) proportional to the household's total budget: $p_i c_i = \beta_i wl$.

Industries. Taking prices and the wage rate as given, any sector i chooses the amount of labour and of domestic and foreign intermediate inputs so as to maximize its net profits subject to the production technology and to the zero-profit condition:

$$\max_{l_i,\{x_{ij}\}_{j\in\mathfrak{T}_n},\{\bar{x}_{ij}\}_{\in\mathfrak{T}_n}} \pi_i = p_i y_i - wl_i - \sum_{j=1}^{n} p_j x_{ij} - \sum_{j=1}^{n} \bar{p}_j(1+\varepsilon_j t_j)\bar{x}_{ij}$$

$$subject\ to \quad y_i = l_i^{\alpha_i} \prod_{j\in\mathcal{N}_i} \left(x_{ij}^{\frac{\sigma_j-1}{\sigma_j}} + \bar{x}_{ij}^{\frac{\sigma_j-1}{\sigma_j}} \right)^{\frac{\sigma_j}{\sigma_j-1}a_{ij}} \quad and \quad \pi_i = 0$$

where $\mathcal{N}_i \subseteq \mathfrak{T}_n$ is the set of industries that supply industry i with intermediate goods. The Lagrangian function for this problem is:

$$\mathcal{L}_i = p_i y_i - wl_i - \sum_{j=1}^{n} p_j x_{ij} - \sum_{j=1}^{n} \bar{p}_j(1+\varepsilon_j t_j)\bar{x}_{ij} + \\ + \lambda_i \left\{ l_i^{\alpha_i} \prod_{j\in\mathcal{N}_i} \left(x_{ij}^{\frac{\sigma_j-1}{\sigma_j}} + \bar{x}_{ij}^{\frac{\sigma_j-1}{\sigma_j}} \right)^{\frac{\sigma_j}{\sigma_j-1}a_{ij}} - y_i \right\}$$

with $\lambda_i = p_i$. Differentiating $\mathcal{L}_i$ with respect to l_i, x_{ij} and $\bar{x}_{ij}$, yields the following set of first-order conditions:

$$l_i = \frac{p_i \alpha_i y_i}{w} \tag{4.20}$$

$$x_{ij} = \frac{p_i a_{ij} y_i}{p_j} \left[1 + \left(\frac{p_j}{\bar{p}_j(1+\varepsilon_j t_j)} \right)^{\sigma_j - 1} \right]^{-1} \tag{4.21}$$

$$\bar{x}_{ij} = \frac{p_i a_{ij} y_i}{\bar{p}_j(1+\varepsilon_j t_j)} \left[\left(\frac{\bar{p}_j(1+\varepsilon_j t_j)}{p_j} \right)^{\sigma_j - 1} + 1 \right]^{-1}. \tag{4.22}$$

From the first condition, it follows that the labour cost in any industry is a constant fraction of its total sales:

$$\alpha_i = \frac{wl_i}{p_i y_i}.$$

Similarly, if we combine the other two conditions, we have that also the cost borne by any industry for each intermediate good is some constant fraction of its total sales:

$$a_{ij} = \frac{p_j x_{ij} + \bar{p}_j\left(1 + \varepsilon_j t_j\right)\bar{x}_{ij}}{p_i y_i}.$$

Labour market-clearing condition. Recall that the wage rate w is homogenous across industries. Summing up optimal labour costs for all industries, yields:

$$w\sum_{i=1}^{n} l_i = \sum_{i=1}^{n} \alpha_i p_i y_i$$

and, from the labour market-clearing condition, it follows:

$$wl = \alpha \cdot s$$

that is, the wage bill wl is equal to the scalar product of the vector of labour's output elasticities and the vector of total sales. As equation 4.11 and the property of constant returns to scale imply in turn:

$$VA = \sum_{i=1}^{n} p_i y_i - \sum_{i=1}^{n}\sum_{j=1}^{n}\left(p_j x_{ij} + \bar{p}_j\left(1 + \varepsilon_j t_j\right)\bar{x}_{ij}\right) = \alpha \cdot s,$$

it becomes therefore evident that the wage bill is equivalent to the aggregate value added (or GDP).

Goods market-clearing condition. If, in the market-clearing condition for industry i (equation 4.5), we substitute for the optimal demand of x_{ji}

and $\bar{x}_{ji}$ by every industry j (equations 4.21 and 4.22), we have:

$$p_i y_i = p_i c_i + \sum_{j=1}^{n} p_j a_{ji} y_j . \tag{4.23}$$

In matrix form, the previous equality can be re-written as:

$$\begin{bmatrix} 1-a_{11} & \cdots & -a_{n1} \\ \vdots & \ddots & \vdots \\ -a_{1n} & \cdots & 1-a_{nn} \end{bmatrix} \begin{pmatrix} p_1 y_1 \\ \vdots \\ p_n y_n \end{pmatrix} = \begin{pmatrix} p_1 c_1 \\ \vdots \\ p_n c_n \end{pmatrix},$$

Since the matrix on the left hand-side, $[I - A']$, is column diagonally dominant, it is non-singular and its inverse exists. Moreover, since the norm of $A' \geq 0$ is less than one, all the eigenvalues of A' lie inside the unit circle and the following representation of $[I - A']^{-1}$ is possible:

$$[I - A']^{-1} = [I + A' + (A')^2 + \cdots].$$

Therefore, the vector of total sectoral sales can be derived as:

$$\begin{pmatrix} p_1 y_1 \\ \vdots \\ p_n y_n \end{pmatrix} = [I - A']^{-1} \begin{pmatrix} p_1 c_1 \\ \vdots \\ p_n c_n \end{pmatrix} = [I + A' + (A')^2 + \cdots] \begin{pmatrix} p_1 c_1 \\ \vdots \\ p_n c_n \end{pmatrix}.$$

Total sales in any sector i depend on the (nominal) demand for each domestic final good via the non-negative elements in the ith row of the matrix $[I - A']^{-1}$. That is, how much industry i sells on the market is determined by the final demand, not only from the same industry, but also from all other industries, according to the importance of inland industry i as a direct and indirect input supplier.

4.5.2 Proofs of results in Section 4.2.3

Effect of input tariff shock on GDP. In Section 4.5.1 we have shown that, as profits are zero in the presence of perfect competition and Cobb-Douglas technologies with constant returns to scale and the wage rate is homogenous across industries, the total value added in the economy is simply equal to the wage bill wl. In particular, if we recall that the

optimal labour supply l is determined only by the disutility from work, all the effect will be captured by the wage rate w.

Plugging the optimal factor demands of industry i (equations 4.20-4.22) into its production technology (equation 4.2), applying the condition $\alpha_i + \sum_{j=1}^{n} a_{ij} = 1$ and taking logs, yields:

$$\alpha_i log w = log p_i + H_i + \sum_{j=1}^{n} \frac{a_{ij}}{\sigma_j - 1} log \left[{p_j}^{1-\sigma_j} + \left(\bar{p}_j (1 + \varepsilon_j t_j) \right)^{1-\sigma_j} \right]$$

$$with \quad H_i = \alpha_i log \alpha_i + \sum_{j=1}^{n} a_{ij} \, log a_{ij}.$$

For simplicity, we assume here that $\bar{p}_j = \mu_j p_j$ for every j, with μ_j being a non-negative proportionality constant. Then, the previous equation becomes:

$$\alpha_i log w = log p_i + H_i + \\ - \sum_{j=1}^{n} a_{ij} \, log p_j + \sum_{j=1}^{n} \frac{a_{ij}}{\sigma_j - 1} log \left[1 + \left(\mu_j \left(1 + \varepsilon_j t_j \right) \right)^{1-\sigma_j} \right] \quad (4.24)$$

or, in vector form:

$$\alpha log w = [I - A] log p + H + A \begin{pmatrix} (\sigma_1 - 1)^{-1} log \left[1 + \left(\mu_1 (1 + \varepsilon_1 t_1) \right)^{1-\sigma_1} \right] \\ \vdots \\ (\sigma_n - 1)^{-1} log \left[1 + \left(\mu_n (1 + \varepsilon_n t_n) \right)^{1-\sigma_n} \right] \end{pmatrix}$$

Since A is a non-negative matrix and has all column sums less than one, the inverse of $[I - A]$ exists and can be approximated by the convergent power series $[I + A + A^2 + \cdots]$. Thus, if we pre-multiply both sides of the last equality by the so-called influence vector $v' = (1/n)\mathbf{1}'[I - A]^{-1}$, we get:

$$log w = \frac{1}{n} \mathbf{1}' log p + v' H + v' A \begin{pmatrix} (\sigma_1 - 1)^{-1} log \left[1 + \left(\mu_1 (1 + \varepsilon_1 t_1) \right)^{1-\sigma_1} \right] \\ \vdots \\ (\sigma_n - 1)^{-1} log \left[1 + \left(\mu_n (1 + \varepsilon_n t_n) \right)^{1-\sigma_n} \right] \end{pmatrix}$$

Finally, by choosing the average price normalization so that:

$$logl + v'H + log\prod_{i=1}^{n} p_i^{1/n} = 0,$$

we obtain:

$$logw + logl = v' \cdot A \begin{pmatrix} (\sigma_1 - 1)^{-1} log\left[1 + \left(\mu_1(1+\varepsilon_1 t_1)\right)^{1-\sigma_1}\right] \\ \vdots \\ (\sigma_n - 1)^{-1} log\left[1 + \left(\mu_n(1+\varepsilon_n t_n)\right)^{1-\sigma_n}\right] \end{pmatrix}$$

This characterization result highlights that a positive input tariff shock to any industry i entails an overall loss in the logarithm of the economy's total value added which stems from a cascade of downstream adjustments: indeed, faced with a higher relative price for the imported intermediate input variety, the immediate customers of industry i are forced to replace it with the corresponding domestic variety; as a result, they experience a drop in productivity and will find it optimal to lower output by some amount, creating negative indirect effects also on their own customers and so on.

Effect of input tariff shock on (relative) prices and consumption levels. For this part of the proof, let $\hat{p}_i = p_i/w$ for every i. As $\alpha_i = 1 - \sum_{j=1}^{n} a_{ij}$ with $a_{ij} \geq 0$ and $\sum_{j=1}^{n} a_{ij} < 1$, equation 4.24 implies:

$$log\hat{p}_i = -H_i + \sum_{j=1}^{n} a_{ij}\, log\hat{p}_i - \sum_{j=1}^{n} \frac{a_{ij}}{\sigma_j - 1} log\left[1 + \left(\mu_j\left(1+\varepsilon_j t_j\right)\right)^{1-\sigma_j}\right]$$

or, in vector form:

$$log\hat{p} = -(I-A)^{-1}\left\{H + A\begin{pmatrix} [\sigma_1 - 1]^{-1} log\left[1 + \left(\mu_1(1+\varepsilon_1 t_1)\right)^{1-\sigma_1}\right] \\ \cdots \\ [\sigma_n - 1]^{-1} log\left[1 + \left(\mu_n(1+\varepsilon_n t_n)\right)^{1-\sigma_n}\right] \end{pmatrix}\right\}$$

Thus, as a consequence of a tariff increase in industry i, all national industries that directly or indirectly rely on it witness a rise in their relative price.

Taking, instead, logs of the household's optimal consumption spending on any commodity i (equation 4.9), we have:

$$logc_i = log\beta_i - log\hat{p}_i + logl$$

or, in vector form:

$$logc = \mathbf{1}logl + log\beta - log\hat{p}$$

From the expression for the equilibrium vector of relative prices, it follows then:

$$logc = logc(0) + (I - A)^{-1}A\begin{pmatrix} [\sigma_1 - 1]^{-1}log\left[1 + \left(\mu_1(1 + \varepsilon_1 t_1)\right)^{1-\sigma_1}\right] \\ \vdots \\ [\sigma_n - 1]^{-1}log\left[1 + \left(\mu_n(1 + \varepsilon_n t_n)\right)^{1-\sigma_n}\right] \end{pmatrix},$$

$$with \quad logc(0) = \mathbf{1}logl + log\beta$$

As total labour supply depends only on the disutility from work, it is evident that the effect of a sectoral input tariff shock on the final consumption of a given good is exactly opposite to the effect on the corresponding domestic relative price. This finding follows from the Cobb-Douglas nature of the household's utility over final goods.

Effect of input tariff shock on output levels. To evaluate the impact on sectoral output quantities, divide both sides of equation 4.23 by $p_i c_i$ and use the optimality condition for household consumption (equation 4.9):

$$\frac{y_i}{c_i} = 1 + \sum_{j=1}^{n} \frac{\beta_j a_{ji}}{\beta_i} \frac{y_j}{c_j}$$

In matrix form, the resulting system can be written as:

$$\begin{bmatrix} 1 - a_{11} & \cdots & -\frac{\beta_n}{\beta_1} a_{n1} \\ \vdots & \ddots & \vdots \\ -\frac{\beta_1}{\beta_n} a_{1n} & \cdots & 1 - a_{nn} \end{bmatrix} \begin{pmatrix} \frac{y_1}{c_1} \\ \vdots \\ \frac{y_n}{c_n} \end{pmatrix} = \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$$

Under symmetric preferences - i.e. $\beta_i = 1/n$ for every i (Acemoglu et al., 2012) -, the matrix on the left-hand side simplifies to $[I - A']$. As A' is element-wise non-negative and has norm less than one, we can then express the equilibrium vector of output-to-consumption ratios as:

$$\begin{pmatrix} \frac{y_1}{c_1} \\ \vdots \\ \frac{y_n}{c_n} \end{pmatrix} = [I - A']^{-1} \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$$

Thus, in response to a sector-specific tariff increase, the quantity produced of any good varies in exactly the same way as the quantity consumed of the same good. This is a consequence of the Cobb-Douglas constant-returns-to-scale assumption for sectoral production functions.

4.5.3 Proof of result in Section 4.3

Under corporate profit taxation, the representative firm in any sector i solves the following maximization problem taking prices as given:

$$\max_{l_i, \{x_{ij}\}_{j \in \mathfrak{I}_n}, \{\bar{x}_{ij}\}_{k \in \mathfrak{I}_n}} \pi_i = (1-\tau)\left(p_i \vartheta_i y_i - w l_i - \sum_{j=1}^{n} p_j x_{ij} \right) + \\ + (1 - \varphi\tau)\left((1-\vartheta_i) p_i y_i - \sum_{j=1}^{n} \bar{p}_j \bar{x}_{ij} \right)$$

$$subject\ to \qquad y_i = l_i^{\alpha_i} \prod_{j \in \mathcal{N}_i} \left(x_{ij}^{\frac{\sigma_j - 1}{\sigma_j}} + \bar{x}_{ij}^{\frac{\sigma_j - 1}{\sigma_j}} \right)^{\frac{\sigma_j}{\sigma_j - 1} a_{ij}} \qquad and \quad \pi_i = 0$$

where $\varphi = 1$ in the presence of border-adjustments and $\varphi = 0$ otherwise.

Taking the derivative of the corresponding Lagrangian function with respect to l_i, x_{ij} and $\bar{x}_{ij}$, and applying the zero-profit condition, yields:

$$l_i = \frac{p_i \left[1 - \tau\left(\vartheta_i + \varphi(1 - \vartheta_i) \right) \right] \alpha_i y_i}{w(1-\tau)}$$

$$x_{is} = \frac{p_i\left[1-\tau\left(\vartheta_i+\varphi(1-\vartheta_i)\right)\right]a_{is}y_i}{p_s(1-\tau)}\left[1+\left(\frac{p_s(1-\tau)}{\bar{p}_s(1-\varphi\tau)}\right)^{\sigma_s-1}\right]^{-1}$$

$$\bar{x}_{is} = \frac{p_i\left[1-\tau\left(\vartheta_i+\varphi(1-\vartheta_i)\right)\right]a_{is}y_i}{\bar{p}_s(1-\varphi\tau)}\left[\left(\frac{\bar{p}_s(1-\varphi\tau)}{p_s(1-\tau)}\right)^{\sigma_s-1}+1\right]^{-1}$$

Note that, in the absence of border-adjustments, the optimal demand for inputs is independent of τ; uniform corporate profit taxation affects optimal input choice only when it discriminates between domestic and imported production factors.

Next, if we substitute the first-order conditions of representative firm i into its production function, take logs of both sides and use the fact that $\alpha_i + \sum_{j=1}^{n} a_{ij} = 1$, we get:

$$\alpha_i log w = log p_i + log\left[1-\tau\left(\vartheta_i+\varphi(1-\vartheta_i)\right)\right] - \alpha_i\, log(1-\tau) + H_i + \\ + \sum_{j=1}^{n}\frac{a_{ij}}{\sigma_j-1} log\left[\left(p_j(1-\varphi\tau)\right)^{1-\sigma_j} + \left(\bar{p}_j(1-\varphi\tau)\right)^{1-\sigma_j}\right]$$

where again $H_i = \alpha_i log\alpha_i + \sum_{j=1}^{n} a_{ij}\, log a_{ij}$. Under the assumption of a (positive) proportional relationship between domestic and foreign sectoral input prices, the resulting system of equations can be written in vector notation as:

$$\alpha\, log w = (I-A) log p + log\begin{pmatrix}1-\tau\left(\vartheta_1+\varphi(1-\vartheta_1)\right)\\ \vdots \\ 1-\tau\left(\vartheta_n+\varphi(1-\vartheta_n)\right)\end{pmatrix} - \alpha\, log(1-\tau) + \\ + H + A\begin{pmatrix}(\sigma_1-1)^{-1} log\left[(1-\tau)^{1-\sigma_1} + \left(\mu_1(1-\varphi\tau)\right)^{1-\sigma_1}\right]\\ \vdots \\ (\sigma_n-1)^{-1} log\left[(1-\tau)^{1-\sigma_n} + \left(\mu_n(1-\varphi\tau)\right)^{1-\sigma_n}\right]\end{pmatrix}$$

Finally, pre-multiplying both sides of the last equality by the influence vector $v' = (1/n)\mathbf{1}'[I-A]^{-1}$, and normalizing the average price so that:

$$log l + v'H + log\prod_{i=1}^{n} p_i^{1/n} = 0$$

we obtain:

$$logw + logl = v' log \begin{pmatrix} 1 - \tau\left(\vartheta_1 + \varphi(1 - \vartheta_1)\right) \\ \vdots \\ 1 - \tau\left(\vartheta_n + \varphi(1 - \vartheta_n)\right) \end{pmatrix} - log(1 - \tau) +$$

$$+ v' \cdot A \begin{pmatrix} (\sigma_1 - 1)^{-1} log \left[(1 - \tau)^{1-\sigma_1} + \left(\mu_1(1 - \varphi\tau)\right)^{1-\sigma_1}\right] \\ \vdots \\ (\sigma_n - 1)^{-1} log \left[(1 - \tau)^{1-\sigma_n} + \left(\mu_n(1 - \varphi\tau)\right)^{1-\sigma_n}\right] \end{pmatrix}$$

Thus, the change in the logarithm of value added arising from the inclusion of border-adjustments into corporate profit taxation amounts to:

$$logwl(\varphi = 0) - logwl(\varphi = 1) =$$

$$= v' \cdot \begin{pmatrix} log \dfrac{1 - \tau\vartheta_1}{1 - \tau} \\ \vdots \\ log \dfrac{1 - \tau\vartheta_n}{1 - \tau} \end{pmatrix} + v' \cdot A \begin{pmatrix} (\sigma_1 - 1)^{-1} log \dfrac{(1 - \tau)^{\sigma_1 - 1} + \mu_1^{\sigma_1 - 1}}{1 + \mu_1^{\sigma_1 - 1}} \\ \vdots \\ (\sigma_n - 1)^{-1} log \dfrac{(1 - \tau)^{\sigma_n - 1} + \mu_n^{\sigma_n - 1}}{1 + \mu_n^{\sigma_n - 1}} \end{pmatrix}$$

where the first term on the right-hand side reflects the positive (direct and indirect) effect of the implicit export subsidy and the second term captures the negative (direct and indirect) effect of the implicit import tax.

4.5.4 Cobb-Douglas-CES utility function

In Section 4.2, we study the implications of a tariff hike targeted at imported intermediate goods in the presence of input-output linkages among industries. To this end, we postulate, for simplicity, that the representative household derives utility only from final goods produced by domestic industries.

Let us now suppose, instead, that the sector-specific final good consumption c_i is, in turn, a CES combination of a quantity f_i purchased

from domestic producers at price p_i and a quantity $\bar{f}_i$ purchased from foreign producers at price $\bar{p}_i(1+\varepsilon_i t_i)$:

$$c_i = \left[f_i^{\frac{\rho_i - 1}{\rho_i}} + \bar{f}_i^{\frac{\rho_i - 1}{\rho_i}} \right]^{\frac{\rho_i}{\rho_i - 1}}$$

where $\rho_i > 1$ is the elasticity of substitution between the domestic and foreign variety of the final good produced within sector i. The maximization problem for the representative household then implies:

$$f_i = \frac{wl\beta_i}{p_i}\left[1 + \left(\mu_i(1+\varepsilon_i t_i)\right)^{1-\rho_i}\right]^{-1}$$

$$\bar{f}_i = \frac{wl\beta_i}{\bar{p}_i(1+\varepsilon_i t_i)}\left[1 + \left(\mu_i(1+\varepsilon_i t_i)\right)^{1-\rho_i}\right]^{-1}$$

Yet, as all sectoral production technologies exhibit constant returns to scale, prices are independent of the demand side and the log of aggregate value added is still given by equation 4.14.

References

Aaronson, D., (2001), "Price pass-through and the minimum wage", The Review of Economics and Statistics, Vol. 83, Issue 1, pp. 158–169.

Abadie, A., and J. Gardeazabal (2003), "The economic costs of conflict: A case study of the Basque Country", American Economic Review, Vol. 93, Issue 1, pp. 113–132.

Abadie, A., and G. W. Imbens (2006), "Large sample properties of matching estimators for average treatment effects", Econometrica, Vol. 74, Issue 1, pp. 235–267.

Acemoglu, D., V.M. Carvalho, A. Ozdaglar and A. Tahbaz-Salehi (2012), "The network origins of aggregate fluctuations", Econometrica, Vol. 80, Issue 5, pp. 1977–2016

Acemoglu, D., U. Akcigit and W. Kerr (2016), "Networks and the macroeconomy: an empirical exploration", National Bureau of Economic Research Macroeconomics Annual, Vol. 30 , Issue 1, pp. 273-353.

Acemoglu, D., D. Autor, D. Dorn, G. Hanson and B. Price (2016), "Import competition and the great US employment sag of the 2000s", Journal of Labor Economics, Vol.34, Issue 1, pp. S141–98.

Acemoglu, D., and P. D. Azar (2018), "Endogenous production networks", Working paper.

Affendy, A. M., Yee L. S., Satoru M. (2010), "Commodity-industry classification proxy: A correspondence table between SITC revision 2 and ISIC revision 3", MPRA Paper, 27626.

Agnew, J., and M. Shin (2017), "Spatializing populism: taking politics to the people in Italy", Annals of the American Association of Geographers, Vol. 107, Issue 4, pp. 915–933.

Algan Y., Guriev S., Papaioannou E., Passari E. (2017), "The European trust crisis and the rise of populism", Brookings Papers on Economic Activity, Vol. 48, Issue 2, pp. 309-400.

Allegretto, S., A. Dube, and M. Reich (2011), "Do minimum wages really reduce teen employment? Accounting for heterogeneity and selectivity in state panel data", Industrial Relations: A Journal of Economy and Society, Vol. 50, Issue 2, pp. 205–240.

Allegretto, S., A. Dube, M. Reich, and B. Zipperer (2013), "Credible research designs for minimum wage studies", IZA Discussion Paper, No. 7638.

Allegretto, S., and M. Reich (2018), "Are local minimum wages absorbed by price increases? Estimates from internet-based restaurant menus", ILR Review, Vol. 71, Issue 1, pp. 35–63.

Artuç, E., S. Chaudhuri and J. McLaren (2010), "Trade shocks and labour adjustment: A structural empirical apporach", American Economic Review, Vol. 100, Issue 3, pp. 1008-45.

Atalay, E., (2017), "How important are sectoral shocks?", American Economic Journal: Macroeconomics, Vol. 9, Issue 4, pp. 254-80.

Auerbach, A. J., and M.P. Devereux, (2013) "Consumption and cash-flow taxes in an international setting", NBER Working Paper, No. 19579.

Auerbach, A., M. P. Devereux, M. Keen and J. Vella, (2017) "Destination-based cash flow taxation", Oxford University Center for Business Taxation Working Paper, No. 17/01.

Autor, D. H., D. Dorn and G. H. Hanson, (2013), "The China syndrome: Local labor market effects of import competition in the United States", American Economic Review, Vol. 103, No. 6, pp. 2121-2168.

Autor D. H., Dorn D., Hanson G. H., Majlesi K. (2016), "Importing political polarization? The electoral consequences of rising trade exposure", NBER Working Paper, No. 22637.

Autor, D., (2017), "Economic and political consequences of China's rise for the United States: Lessons from the China shock", IFS Annual Lecture 2017.

Bachmann, R., T. K. Bauer, J. Kluve, S. Schaffner and C. M. Schmidt (2008), "Mindestlöhne in Deutschland: Beschäftigungswirkungen und

fiskalische Effekte", RWI Leibniz Institut für Wirtschaftsforschung, RWI Materialien, Heft 43.

Bachmann, R., and H. Frings (2017), "Monopsonistic competition, low-wage labour markets, and minimum wages – An empirical analysis", Applied Economics, Vol. 49, Issue 51, pp. 5268–5286.

Bai, J., (2009), "Panel data models with interactive fixed effects", Econometrica, Vol. 77, Issue 4, pp. 1229–1279.

Baldwin, R., (2016), "The great convergence: Information technology and the new globalization", Cambridge: Belknap Press of Harvard University Press.

Baqaee, D.R., and E. Fahri (2018a), "Macroeconomics with heterogenous agents and input-output networks", Working Paper.

Baqaee, D.R., and E. Fahri (2018b), "Productivity and misallocation in general equilibrium", Working Paper.

Baran, P. A., and P. Sweezy, (1966), "Monopoly capital: An essay on the American economic and social order", Monthly Review Press, New York and London.

Barbiero, O., E. Farhi, G. Gopinath, and O. Itskhoki (2018), "The macroeconomics of border taxes", NBER Working Paper, No. 24702.

Bauer, T. K., J. Kluve, S. Schaffner and C. M. Schmidt (2009), "Fiscal effects of minimum wages: An analysis for Germany", German Economic Review, Vol. 10, Issue 2, pp. 224–242.

Becker, S. O., and T. Fetzer (2016), "Does migration cause extreme voting?", Center for Competitive Advantage in the Global Economy Working Paper, No. 306.

Belman, D., and P. J. Wolfson (2014), "What does the minimum wage do?", Upjohn Press, Kalamazoo MI.

Belman, D., and P. J. Wolfson (2016), "15 years of research on U.S. employment and the minimum wage", Tuck School of Business Working Paper, No. 2705499.

Bernard, A. B., and A. Moxnes (2018), "Networks and trade", Annual Review of Economics, Vol. 10, Issue 1, pp. 65–85.

Bersch, J., S. Gottschalk, B. Müller and M. Niefert, (2014), "The Mannheim Enterprise Panel (MUP) and firm statistics for Germany", ZEW Discussion Papers, No. 14-104.

Bhagwati, J., and V. K. Ramaswami, (1963), "Domestic distortions, tariffs and the theory of pptimum subsidy", Journal of Political Economy, Vol. 71, No. 1, pp. 44-50.

Bigio, S., and J. La'O (2017), "Distortions in production networks", Working Paper.

Blanchard, E.J., C.P. Bown and R.C. Johnson (2016), "Global supply chains and trade policy", NBER Working Paper, No. 21883.

Blaum, J., L. Claire and P. Michael (2016), "The gains from input trade with heterogeneous importers", CEPR Discussion Paper, No. 11721.

Blonigen, B. A., and J. McGrew (2014), "Task routineness and trade policy preferences. Economics & Politics, Vol. 26, Issue 3, pp. 505-518.

Bonin, H., I. E. Isphording, A. Krause, A. Lichter, N. Pestel, U. Rinne and Et Al. (2018), "Auswirkungen des gesetzlichen Mindestlohns auf Beschäftigung, Arbeitszeit und Arbeitslosigkeit", IZA Research Report, No. 83.

Bordignon F., Ceccherini L. (2015), "The Five-Star Movement: a hybrid actor in the net of state institutions", Journal of Modern Italian Studies, Vol. 20, Issue 4, pp. 454-473.

Bosch, G., (2018), "The making of the German minimum wage: a case study of institutional change", Industrial Relations Journal, Vol. 49, No. 1, pp. 19–33.

Bossler, M., and H.-D. Gerner (2016), "Employment effects of the new German minimum wage: Evidence from establishment-level micro data", IAB Discussion Paper, No. 201610.

Bossler, M., N. Gürtzgen, B. Lochner, U. Betzl, L. Feist and J. Wegmann (2018), "Auswirkungen des gesetzlichen Mindestlohns auf Betriebe und Unternehmen", IAB Forschungsbericht, No. 4/2018.

Brown, C., C. Gilroy, and A. Kohen (1982), "The effect of the minimum wage on employment and unemployment", Journal of Economic Literature, Vol. 20, No. 2, pp. 487-528.

Bugamelli, M., F. Schivardi and R. Zizza (2010), "The Euro and firm restructuring", in Alesina, A., and F. Giavazzi (Eds.), Europe and the Euro, The University of Chicago Press, Chicago and London.

Burauel, P., M. Caliendo, A. Fedorets, M. M. Grabka, C. Schröder, J. Schupp and L. Wittbrodt (2017), "Minimum wage not yet for everyone: On the compensation of eligible workers before and after the minimum wage reform from the perspective of employees", DIW Economic Bulletin, Vol. 7, Issue 49, pp. 509–522.

Burauel, P., M. M. Grabka, C. Schröder, M. Caliendo, C. Obst and M. Preuss (2018), "Auswirkungen des gesetzlichen Mindestlohn auf die Lohnstruktur", DIW.

Caliendo, M., A. Fedorets, M. Preuss, C. Schröder and L. Wittbrodt (2018), "The short-run employment effects of the German minimum wage reform", Labour Economics, Vol. 53, Issue C, pp. 46–62.

Caliendo, L., and F. Parro (2015), "Estimates of the trade and welfare effects of NAFTA", Review of Economic Studies, Vol. 82, Issue 1, pp. 1-44.

Caliendo, L., F. Parro and A. Tsyvinski (2018b), "Distortions and the structure of the world economy", NBER Working Paper No 23332.

Caliendo, L., R. C. Feenstra, J Romalis and A. M. Taylor (2017), "Tariff reductions, entry, and welfare: Theory and evidence for the last two decades", CEPR Discussion Paper, No. 10962 (revised version).

Caliendo, M., C. Schröder and L. Wittbrodt (2018), "The causal effects of the minimum wage introduction in Germany: An overview", IZA Discussion Paper, No. 12043.

Cameron, D., (1978), "The expansion of the public economy", American Political Science Review, Vol. 72, Issue 4, pp. 1243–1261.

Card, D., and A. B. Krueger (1995), "Myth and measurement: The new economics of the minimum wage", Princeton University Press, Princeton NJ.

Carvalho, V. M., and N. Voigtlander (2015), "Input diffusion and the evolution of production ¨ networks", NBER Working Paper No. 20025.

Carvalho, V.M., M. Nirei, Y.U. Saito and A. Tahbaz-Salehi (2017), "Supply chain disruptions: Evidence from the great East Japan earthquake", Becker Friedman Institute for Reasearch in Economics Working Paper, No. 2017-01.

Carvalho, V.M., and A. Tahbaz-Salehi (2018), "Production networks: A primer", Annual Review of Economics, Cambridge Working Papers in Economics, No. 1856.

Caselli, M., A. Fracasso, and S. Traverso (2018), "Globalization and electoral outcomes. Evidence from Italy", DEM Working paper, No. 2018/7.

Cengiz, D., A. Dube, A. Lindner and B. Zipperer (2018), "The effect of minimum wages on low-wage jobs: Evidence from the United States Using a Bunching Estimator", LSE CEP Discussion Paper, No. 1531.

Chaney, T., (2016), "Networks in international trade,", in Oxford Handbook of the Economics of Networks (Yann Bramoulle, Andrea Galeotti, and Brian Rogers, eds.), Oxford University Press, Oxford.

Che, Y., Y. Lu, P. Schott and Z. Tao (2016), "Does trade liberalization with China influence U.S. elections?", NBER Working Paper, No. 22178.

Chudik, A. and M. H. Pesaran (2015) "Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors", Journal of Econometrics, Vol. 188, Issue 2, pp. 393–420.

Colantone I., and P. Stanig (2018b), "The trade origins of economic nationalism: Import competition and voting behaviour in Western Europe", American Journal of Political Science, Vol. 62, Issue 4, pp. 936-953.

Costinot, A., and A. Rodríguez-Clare (2014), "Trade theory with numbers: quantifying the consequences of globalization", Handbook of International Economics, Vol. 4, pp. 197-261.

Dauth W., S. Findeisen and J. Suedekum (2014), "The rise of the East and the far East: German labor markets and trade integration", Journal of the European Economic Association, Vol. 12, Issue 6, pp. 1643-1675.

Dhingra, S., H. Huang, G. Ottaviano, J.P. Pessoa, T. Sampson and J. Van Reenen (2017), "The costs and benefits of leaving the EU: trade effects", Centre for Economic Performance, Discussion Paper No. 1478.

Dippel C., Gold R., Heblich S., Pinto R. (2017), "Instrumental variables and causal mechanisms: Unpacking the effect of trade on workers and voters", NBER Working Paper, No. 23209.

Draca, M., S. Machin and J. Van Reenen (2011), "Minimum wages and firm profitability", American Economic Journal: Applied Economics, Vol. 3, Issue 1, pp. 129–151.

Dube, A., T. W. Lester and M. Reich (2010), "Minimum wage effects across state borders: Estimates using contiguous counties", The Review of Economics and Statistics, Vol. 92, Issue 4, pp. 945–964.

Dube, A., T. W. Lester and M. Reich (2016), "Minimum wage shocks, employment flows, and labour market frictions", Journal of Labor Economics, Vol. 34, Issue 3, pp. 663–704.

Dube, A., and B. Zipperer (2015), "Pooling multiple case studies using synthetic controls: An application to minimum wage policies", IZA Discussion Paper, No. 8944.

Dustmann, C., B. Fitzenberger, U. Schönberg and A. Spitz-Oener (2014), "From sick man of Europe to economic superstar: Germany's resurgent economy", Journal of Economic Perspectives, Volume 28, Issue 1, pp. 167–88.

Dustmann C., Eichengreen B., Otten S., Sapir A., Tabellini G., Zoega G. (2017), "Europe's trust deficit: Causes and remedies", Monitoring International Integration 1, CEPR Press.

Emmanuel, A., (1972), "Unequal exchange: A study of the imperialism of trade", Monthly Review Press, New York and London.

Egeln, J., (2016), "Minimum wage–burden on young companies greater than expected", https://www.zew.de/en/presse/pressearchiv/mindestlohn-belastung-fuer-junge-unternehmen-staerker-als-erwartet/ [Accessed: 21/11/2018].

Fahri, E., G. Gopinath and O. Itskhoki, (2017), "Trump's tax plan and the dollar", Project Syndicate, January 3.

Federico, S., (2014), "Industry dynamics and competition from low-wage countries: Evidence on Italy", Oxford Bulletin of Economics and Statistics, Vol. 76, Issue 3, pp. 389-410.

Feenstra, R. C., and G. H. Hanson (1996), "Globalization, outsourcing, and wage inequality", The American Economic Review, Vol. 86, No. 2, pp. 240–245.

Felbermayr, G., J. Gröschl and I. Heiland (2018), "Undoing Europe in a new quantitative trade model", Ifo Institut Working Paper No. 250.

Fetzer, T (2018), "Did austerity cause Brexit?", CAGE Working Paper, No. 381.

Frieden, J., (2017), "The politics of the globalization backlash: Sources and implications", Paper prepared for presentation at the annual meetings of the American Economic Association, panel on "Making Globalization Inclusive".

Garloff, A., (2016) "Side effects of the new German minimum wage on (un-)employment: first evidence from regional data", IAB Discussion Paper, No. 201631.

Gehrels, F., (1971), "Optimal restrictions on foreign trade and investment", American Economic Review, Vol. 61, pp. 147-159.

Grassi, B., (2017), "IO in I-O: Size, industrial organization, and the input-output network make a firm structurally important", Working paper.

Grossman, G M, and E Helpman (1995), "Trade wars and trade talks", Journal of Political Economy, Vol. 103, Issue 4, pp. 675-708.

Guiso L., Herrera H., Morelli M., Sonno T. (2017), "Demand and supply of populism", CEPR Discussion Paper, No. 11871.

Guiso L., Herrera H., Morelli M., Sonno T. (2019), "Global crises and populism: The role of Eurozone institutions", Economic Policy, eiy018.

Haberler, G., (1950), "Some problems in the pure theory of international trade", Economic Journal, Volume 60, pp. 223-240.

Harrison A., McLaren J., McMillan M. (2011), "Recent perspectives on trade and inequality", Annual Review of Economics, Vol. 3, Issue 1, pp. 261–289.

Heckman, J., H. Ichimura and P. Todd (1997), "Matching as an econometric evaluation estimator: Evidence from evaluating a job training program", Review of Economic Studies, Vol. 64, Issue 4, pp. 605–654.

Heckman, J., H. Ichimura and P. Todd (1998), "Matching as an econometric evaluation estimator", Review of Economic Studies, Vol. 65, Issue 2, pp. 261–294.

Humphrey, T.M., (1987), "Classical and neoclassical roots of the theory of optimum tariffs", Federal Reserve Bank of Richmond Economic Review, Vol. 73, Issue 4, pp. 17-28.

Ichino, A., (2014), "The problem of causality in microeconometrics", available at http://www.andreaichino.it/teaching_material/newcausa_5.pdf.

Imbens, G. W., (2015), "Matching methods in practice: Three examples", Journal of Human Resources, Vol. 50, Issue 2, pp. 373–419.

IMF (2017), "Italy: Staff Report for the 2017 Article IV Consultation", IMF Country Report, No. 17/237.

Inglehart, R. F., and P. Norris, (2016), "Trump, Brexit and the rise of populism: Economic have-nots and cultural backlash", Harvard Kennedy School RWP, No. 16-026.

Jensen, J. B., D. P. Quinn and S. Weymouth (2017), "Winners and losers in international trade: The effects on US Presidential voting", International Organization, Vol. 71, Issue 3, pp. 423-457.

Johnson, H (1953), "Optimum tariffs and retaliation", Review of Economic Studies, Vol. 21, Issue 2, pp. 142-153.

Johnson, H. G., (1965a), "Optimal trade intervention in the presence of domestic distortions", in R.E. Caves, H.G. Johnson and P.B. Kenen (ed.), Trade Growth and the Balance of Payments, North Holland, Amsterdam.

Johnson, R.C., and G. Noguera (2012), "Accounting for intermediates: production sharing and trade in value added", Journal of International Economics, Vol. 86, Issue 2, pp. 224-236.

Johnson, R. C. (2018), "Measuring global value chains", Annual Review of Economics, Vol. 10, Issue 1, pp. 207– 236.

Jones, R. W. (1967), "International capital movements and the theory of tariffs and trade", Quarterly Journal of Economics, Vol. 81, Issue 1, pp. 1-38.

Katzenstein, P., (1985), "Small states in world markets: Industrial policy in Europe", Ithaca, NY, Cornell University Press.

Kayser, M. A., (2007), "How domestic is domestic politics? Globalization and elections", Annual Review of Political Science, Vol. 10, Issue, pp. 341-362.

Kemp, M., (1966), "The gains from international trade and investment: a neo Heckscher–Ohlin approach", American Economic Review, Vol. 56, Issue 4, pp. 788–809.

Kennan, J., and R. Riezman (1988), "Do big countries win tariff wars?", International Economic Review, Vol. 29, Issue 1, pp. 81-85.

Klau, M., and S. S. Fung (2006), „The new BIS effective exchange rate indices", BIS Quarterly Review.

Knabe, A., and R. Schöb (2008), "Minimum wage incidence: The case for Germany", CESifo Working Paper Series, No. 2432.

Kraft, K., C. Rammer and S. Gottschalk (2012), "Minimum wages and competition: The case of the German roofing sector", ZEW – Leibniz Centre for European Economic Research, Discussion Paper No. 12-083.

Krugman, P. (2018), "Steel tariffs and wages (painfully wonkish)", The New York Times, April 22.

Lechner, M., (2011): "The estimation of causal effects by difference-in-difference methods", Foundations and Trends in Econometrics, Vol. 4, No.3, pp. 165-224.

Link, S., (2018), "The price and employment response of firms to the introduction of minimum wages", Mimeo.

Liu, S., T. J. Hyclak and K. Regmi, (2016), "Impact of the minimum wage on youth labour markets." Labour, Vol. 30, Issue 1, pp. 18–37.

Liu, E., (2018), "Industrial policies in production networks", Working Paper.

Long, J.B., and C.I. Plosser (1983), "Real business cycles", Journal of Political Economy, Vol. 91, pp. 39-69.

Macrosty, H. W., (1898), "The recent history of the living wage movement." Political Science Quarterly, Vol. 13, Issue 3, pp. 413–441.

Magee, S.R, W.A. Brock, and L. Young (1989), "Black hole tariffs and endogenous policy theory", Cambridge University Press, Cambridge and New York.

Malgouyres M. (2017a), "The impact of Chinese import competition on the local structure of employment and wages: evidence from France", Journal of Regional Science, Vol. 57, Issue 3, pp. 411-441.

Malgouyres M. (2017b), "Trade shocks and far-right voting: Evidence from French Presidential elections", EUI Working Paper RSCAS, No. 2017/21.

Margalit, Y., (2011), "Costly jobs: Trade-related layoffs, government compensation, and voting in U.S. elections", American Political Science Review, Vol. 105, Issue 1, pp. 166-188.

Marino M. R., Zizza R. (2008), "L'evasione dell'Irpef: Una stima per tipologia di contribuente", Mimeo.

Mayda, A. M., and D. Rodrik, (2005), "Why are some people (and countries) more protectionist than others?", European Economic Review, Vol. 49, Issue 6, pp. 1393-1430.

Mayer, W. (1984), "Endogenous tariff formation", American Economic Review, Vol. 74, Issue 5, pp. 970-985.

Mindestlohnkommission (2018), "Zweiter Bericht zu den Auswirkungen des gesetzlichen Mindestlohns. Bericht der Mindestlohnkommission an die Bundesregierung nach § 9 Abs. 4 Mindestlohngesetz", Mindestlohnkommission.

Mudde C. (2007), "Populist radical right parties in Europe", Cambridge University Press, New York.

Müller, K.-U., (2013), "The economic effects of a federal minimum wage in Germany: Empirical studies on its consequences for earnings, income, and employment", PhD dissertation Free University Berlin, Berlin, Germany.

Müller, K.-U., and V. Steiner (2010) "Labour market and income effects of a legal minimum wage in Germany." Free University Berlin, School of Business & Economics Discussion Papers, No. 2010/11.

Myrdal , G., (1957), "Economic theory and underdeveloped regions", Gerald Duckworth & Co., London.

Neumark, D., (2014), "Employment effects of minimum wages", IZA World of Labour, No. 6.

Neumark, D., and W. Wascher (1992), "Employment effects of minimum and subminimum wages: Panel data on state minimum wage laws", ILR Review, Vol. 46, Issue 1, pp. 55-81.

Neumark, D., and W. Wascher (2007), "Minimum wages and employment", Foundations and Trends in Microeconomics, Volume 3, No. 1-2, pp. 1-186.

Neumark, D., and W. Wascher (2007), "Minimum wages", MIT Press, Cambridge MA.

Neumark, D., J. M. I. Salas and W. Wascher (2014), "Revisiting the minimum wage-employment debate: Throwing out the baby with the bathwater", ILR Review, Vol. 67, Issue 3, pp. 608-648.

Nicita, A, M Olarreaga and P Silva (2018), "Cooperation in WTO's tariff waters?", Journal of Political Economy, forthcoming.

Noguera, G., (2012), "Trade costs and gravity for gross and value added trade", Job Market Paper, Columbia University.

Nurkse, R., (1959), "Patterns of trade and development", Wicksell Lectures, Almquist & Wicksell, Stockholm.

Oberfield, E., (2018), "A theory of input-output architecture", Econometrica, Vol. 86, Issue 2, pp. 559–589.

OECD (2017), "OECD economic surveys: Italy 2017", OECD PUBLISHING, Paris.

OECD (2018) ,"Minimum wages relative to median wages", https://www.oecd-ilibrary. org/content/data/data-00313-en [Accessed: 3/11/2018].

Ossa, R., (2015) "Why trade matters after all", Journal of International Economics, Issue 97, pp. 266-277.

Ozdagli, A., and M. Weber (2017), "Monetary policy through production networks: Evidence from the stock market", NBER Working Papers, No. 23424.

Passarelli, G., and D. Tuorto (2012), "The Lega Nord goes south: The electoral advance in Emilia-Romagna: A new territorial model?", Political Geography, Vol. 31, Issue 7, pp. 419–428.

Passarelli, G., (2013), "Extreme right parties in Western Europe: The case of the Italian Northern League", Journal of Modern Italian Studies, Vol. 18, Issue 1, pp. 53–71.

Perani, G., Cirillo V. (2015), "Matching industry classifications: A method for converting NACE rev. 2 to NACE rev. 1", Working Paper Series in Economics, Mathematics and Statistics, University of Urbino.

Pierce, J. R., and P. K. Schott (2016), "The surprisingly swift decline of U.S. manufacturing employment", American Economic Review, Vol. 106, Issue 7, pp. 1632-62.

Pomfret, R., (1992), "International trade policy with imperfect competition", Special Papers in International Economics Princeton University, No. 17.

Pratomo, D. S., (2016), "How does the minimum wage affect employment statuses of youths? Evidence of Indonesia", Journal of Economic Studies.

Prebisch, R., (1950), "The economic development of Latin America and its principal problems", United Nations, New York.

Ragnitz, J., and M. Thum (2007), "The empirical relevance of minimum wages for the low-wage sector", CESifo Forum, Vol. 8, Issue 2, pp. 35–37.

Ricardo, D., (1817), "On the principles of political economy and taxation", John Murray, London.

Rodrik, D., (1998), "Why do more open economies have bigger governments?", Journal of Political Economy, Vol. 106, Issue 5, pp. 997–1032.

Rodrik, D., (2011), "The globalization paradox. Democracy and the future of the world economy.", W. W. Norton & Co., New York.

Rodrik, D., (2018), "Populism and the economics of globalization", Journal of International Business Policy, Vol. 1, Issue 1-2, pp. 12-33.

Rodrik, D., and R. Di Tella (2019), "Labour market shocks and the demand for trade protection: Evidence from online surveys", NBER Working Paper, No. 25705.

Ruggie, J., (1982), "International regimes, transactions and change: Embedded liberalism in the postwar economic order", International Organization, Vol. 36, Issue 2, pp. 379–415.

Scheve, K. F., and M. J. Slaughter (2001a), "Labor market competition and individual preferences over immigration policy", The Review of Economics and Statistics, Vol. 83, Issue 1, pp. 133-145.

Scheve, K. F., and M. J. Slaughter (2001b), "What determines individual trade-policy preferences?", Journal of International Economics, Vol. 54, Issue 2, pp. 267-292.

Scheve, K. F., and M. J. Slaughter (2004), "Economic insecurity and the globalization of production", American Journal of Political Science, Vol. 48, Issue 4, pp. 662-674.

Scheve, K. F., and M. F. Slaughter (2007), "A new deal for globalization", Foreign Affairs, Vol. 86, Issue 4, pp. 34-47.

Schmitt, J., (2013), "Why does the minimum wage have no discernible effect on employment?", CEPR Discussion Paper.

Schnabel, C., (1999), "Collective bargaining under stress: Decentralisation and opening clauses in Germany", Paper prepared for the workshop "Controlled Decentralisation of Wage Bargaining – The German Experience with the Exit Clause" organised by Fondazione Rodolfo DEBENEDETTI and Banca d'Italia in Rome.

Scitovsky, T., (1942), "A reconsideration of the theory of tariffs", Review of Economic Studies, Vol. 9, Issue 2, pp. 89-110.

Singer, H., "The distribution of gains between investing and borrowing countries", American Economic Review, Vol. 40, pp. 473-485.

Smith, J., and P. Todd (2005a), "Does matching overcome Ladondes critique of nonexperimental estimators", Journal of Econometrics, Vol. 125, Issue 1-2, pp. 305–353.

Stolper W., Samuelson P. A. (1941), "Protection and real wages", Review of Economic Studies, Vol. 9, pp. 58-73.

Südekum, J., (2018), "Globalisierung unter Beschuss: Bestandsaufnahme des Freihandels", APuZ, 4-5/2018.

Vandenbussche, H., W. Connell and W. Simons (2017), "Global value chains, trade shocks and jobs: an application to Brexit", Center for Economic Policy Research Discussion Paper, No. 12303

Vandenbussche, H., W. Connell and W. Simons (2018), "The cost of non-TTIP: a global value chain approach", Center for Economic Policy Research Discussion Paper, No. 12705.

Vanhaverbeke, S., (2017), "Disclosure and financial reporting regulation." PhD dissertation KU Leuven, Leuven, Belgium.

van Kessel, S., (2015), "Populist parties in Europe. Agents of discontent?", Palgrave MacMillan, London.

Walter, S., (2010), "Globalization and the welfare state: Testing the microfoundations of the compensation hypothesis", International Studies Quarterly, Vol. 54, Issue 2, pp. 403-426.

Weinkopf, C., (2015), "The bumpy road to a national minimum wage in Germany: Toward revitalizing collective bargaining", in Global Wage Debates: Politics or Economics?, edited by G. Randolph and K. Panknin, Just Jobs Network, pp. 97-110.

Wood, A., (1995), "How trade hurt unskilled workers", Journal of Economic Perspectives, Vol. 9, Issue 3, pp. 57-80.

Wursten, J., (2017), "The employment elasticity of the minimum wage. Is it just politics after all?", Faculty of Economics and Business Working Papers Department of Managerial Economics, Strategy and Innovation (MSI), KU Leuven, No. 591940.

Yi, K.-M., (2003), "Can vertical specialization explain the growth of world trade?", Journal of Political Economy, Vol. 111, Issue 1, pp. 52-102.